THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XVII. Part 1. 10th January, 1919.

AGRICULTURE.

AMERICA AND AUSTRALIA COMPARED.

A lecture comparing agricultural methods in America with those in Australia, arranged by the Royal Agricultural Society, was delivered by Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, at the Playhouse, Melbourne, on the 9th December last, to a large audience, including His Excellency the Governor (Sir Arthur Stanley).

Mr. Richardson said:—Before dealing with the subject-matter of my address, I would like to review briefly some features of American life and organization which appeal to the Australian.

No one visiting the United States could fail to be impressed with the optimism of the Americans—the faith they have in the destiny of their country, the enthusiasm with which they enter into all national projects in peace or in war, and the remarkable organizing power shown in almost every branch of national activity, and the adaptive ability of the American people.

My visit synchronized with the period when the American nation was beginning to exert its full measure of strength in the Allied cause; when their great testing period came—the mobilization and preparation of the army—the transportation of that army and its equipment abroad—and the trial of its manhood in the trenches of France.

The Americans poured the full flood of their resources into the Allied reservoir; they provided men, money, munitions, food, and ships without stint.

Fine work was done in connexion with the production and conservation of foodstuffs. During the past year America sent 300,000,000 bushels of cereal foodstuffs to the Allies, and at a critical time last autumn 90,000,000 bushels of wheat, conserved by voluntary rationing of the American nation, were rushed across the Atlantic to meet the urgent requirements of the Allies.

Organization is not a very dramatic thing, but it usually precedes any successful drama in the conduct of a war, and its absence almost always involves tragedy.

On 6th April, 1917, Congress declared war. On the 9th April an Inter-State Agricultural Conference met under the presidency of the Secretary for Agriculture to consider problems in the production and conservation of food. A State Food Production and Conservation Board was formed in each of the 48 States of the Union. At the head of this movement was Hoover, the man whom the nation trusted, and who wielded power without force, for everything that was done in food conservation was purely voluntary effort on the part of the nation.

There are only two ways of increasing food supplies—consuming less and producing more. The consumption of food was enormously reduced by voluntary rationing and the prevention of waste. The production of food was stimulated by organizing food production campaigns in every State guaranteeing the farmer favorable prices for his produce, and by planting hundreds of thousands of vegetable gardens on unoccupied lands near the cities. The growing of these vegetable gardens relieved the railways of the necessity of carrying thousands of tons of bulky freight, thus releasing engines and cars for the haulage of men and munitions.

As the combined result of these activities, America was able to send to Europe, at a most critical time, no less than 90,000,000 bushels of wheat over and above the exportable surplus which had already been shipped.

During the last two years the United States has become a great ship-building nation. The present output approximates 450,000 tons per month—a 5,000-ton ship every eight hours. Enormous dockyards have been built on the Pacific and Atlantic coasts and on the Great Lakes. One dockyard has accommodation for building 50 vessels simultaneously.

"Independence Day" was celebrated by the launching of 88 vessels, and the slogan used to speed up construction was to make a splash that would reach the ears of the Kaiser.

The achievements of the nation were made possible by organization—selecting great captains of industry, and putting them in charge of the big national departments, and giving them a free hand. Goethals, the builder of the Panama Canal, was made Quartermaster-General of the Army. Hoover, who saved Belgium from starvation in 1916, was appointed Food Administrator, and Schwab, the head of the Steel Corporation, and who built up a munitions works larger than Krupps at Essen, was placed in charge of the ship-building campaign.

The Growth of Nations in Power and Wealth.

The advance of nations in prosperity and power depends on the natural resources which they possess, and the ability of the people to exploit those resources.

The natural resources of the United States are undoubtedly great. They have magnificent agricultural and timber resources, enormous deposits of coal, iron, and minerals necessary for industrial purposes,

and remarkable waterways and lakes which greatly facilitate and cheapen internal transportation.

The wonderful progress in population, wealth, and power is due not so much to the natural resources, but to the wise and energetic development of those resources by the American Government and the American people. Wealth is created by the exploitation of the resources of nature by man. The increase in wealth of a nation endowed with great natural resources depends on three things—

1. The number of men productively employed;
2. Productive efficiency of the workmen;
3. The character of the leadership of the nation.

The United States has always maintained an open door for immigration. Men have been urgently wanted to open up the country, till the farms, subdue the forests, harness the rivers, exploit the mineral wealth, and convert the raw materials of agriculture and mining into finished manufactures. In the year before the war the great number of 1,197,892 immigrants landed in the United States, and complaints of scarcity of labour were never so numerous as during the last five years.

But more important still than mere numbers of men is the productive efficiency of the individual workman. Man is a labour-saving animal. Civilization is based on the use of power, and may be divided into three ages—the age of man power, the age of animal power, the age of engine power. The last age began but yesterday. Man's power may be increased indefinitely by the use of machinery.

The Americans have done more than any nation to enlarge the productive capacity of their workmen by providing them with the most powerful and most perfect labour-saving devices of every kind. This is really one of the causes of America's rapid development in power and opulence during the last generation. She has drained the world for ideas, appropriated inventions of other countries, and has developed and applied labour-saving machinery to her agriculture and to her industries beyond any other nation.

COMPARISONS OF UNITED STATES WITH AUSTRALIA.

The land surface of Australia and that of the United States are approximately the same. In point of fact, Australia has the advantage in size by 691 square miles.

As I reminded many an American audience, the island continent of Australia was sufficiently large to take the 48 States of the Union, and leave a track sufficiently wide to drive a car round the entire edge of the continent. The area of each country is approximately 3,000,000 square miles.

The population of Australia could, however, be accommodated in their largest city—New York. The present population of the States is probably 110,000,000, and this provides a good home market for all forms of agricultural produce, and has led to the stabilization of prices for produce.

The rainfall over at least half the United States is over 20 inches, and is adequate for the requirements of crop production. The heaviest rainfall is in the east—the Atlantic States—and the amount of fall

diminishes from the Atlantic Coast to the Rocky Mountains. The eastern half of the United States is humid, the western half dry.

There is a slightly larger percentage of humid country in the United States than in Australia. With Australia the rainfall diminishes as one proceeds from the coast to the interior. A striking difference between the United States and Australia is that of the middle areas. The middle west—the centre of the United States—enjoys a good rainfall, has magnificent river systems, such as the Mississippi and Missouri, is the centre of a thriving agricultural region, and has numerous large and prosperous towns. The centre of Australia, however, is arid, and has no great river and lake systems.

The western half of the United States is very dry, and over much of it the rainfall is insufficient for crop production. Moreover, in Southern California, Utah, Colorado, and Arizona there are deserts as barren and inhospitable as any on the globe.

On the whole the soils of the United States are fertile. In the middle west the wide valley of the Mississippi includes one of the largest areas of fertile soil in the world. This is the region of the prairies—almost treeless plains—situated in an area of good rainfall.

One may travel for a thousand miles from St. Louis to the Canadian border, and see on either side dark fertile soils. The soils are not unlike those of our Horsham plains. As, however, the greater part of the rain falls in the summer months, maize is the dominant crop.

Over much of the arid west the rainfall is too small to permit of profitable crop production without irrigation. This is the region where irrigation has made tremendous strides.

Droughts often occur in the western half of the United States. At the time of my visit Southern California had just experienced one of the worst droughts on record. In the Rocky Mountain States the Government has advanced a million dollars for supplying distressed farmers with seed wheat this year.

Texas suffered from a two years' drought. In Southern Alberta and Saskatchewan the wheat was suffering in 1918 in the same way as our wheat crops were in 1914. Yet there were no references in bold type in the press to advertise these untoward events.

I asked a Canadian pressman why no reference has been made in the press to the drought in the Southern prairies. He remarked that 2,600 settlers trekked across the border from the United States every month, and they did not wish to interfere with that precious flow of immigration by advertising their droughts far and wide, and thus injuring their credit abroad. Droughts, both in Canada and the United States, are rightly regarded as local incidents in a series of good seasons, and the people endeavour to mitigate their effects by making provision for conservation of fodder and water so as to avoid losses of stock, which are the most serious results of drought.

The agricultural regions of the United States and Canada cannot be compared with Australia in regard to climatic advantages. In the prairies, the Middle West and the Atlantic States, the winters are intensely cold, the temperatures falling below freezing for several months of the year, and this involves hardships both on man and beast. Growth is completely at a standstill, and live stock over the greater part of the

agricultural belt must be housed and hand-fed for at least four months of the year.

At Winnipeg, a typical Canadian town, the average winter temperature is 26 deg. below freezing, and further west the temperatures fall to 50 and 60 deg. below freezing. Nothing could be drearier than the landscape of the Middle West and the prairies of Canada in winter—flat, treeless, snow-covered plains.

In the farm homes an artificial heating system has to be installed to make life tolerable in winter, and costly barns have to be built to house all forms of stock during the winter months. This climatic disadvantage has compelled the farmer to provide large reserves of food for the use of his stock in winter months. The system of hand-feeding, necessitated by the climate, has proved a blessing in disguise, for it has led the farmer to appreciate the value of hand feeding, and to regularly supplement the pastures in summer and autumn by the liberal use of hay, silage, and concentrates.

TRANSPORTATION.

One of the most important factors in developing the agriculture of a country is the provision of an adequate system of transportation.

It has been accepted as an axiom that the prosperity of a country is closely bound up in the adequacy of its railway communcation. When good lands are available the surest way of encouraging the settler is for railways to precede settlement. Instead of deferring the building of a railway until there is ample prospect of the new line paying interest on capital from the commencement, the policy in the United States and Canada has invariably been to precede settlement with developmental railways. This policy led to the opening up of the immense areas of prairie lands in Canada, and more than any other factor has led to the remarkable development of cereal production in Canada during the past twenty years.

American agriculture has been greatly aided by the railways. The value of the American railways is considerably more than twice as much as all the industrial and agricultural machinery of the country combined.

The freight rates on agricultural production are extremely low, the average cost of haulage, according to the Inter-State Commission, being ⅜d. per ton per mile. On this basis the average cost of haulage of all produce from our furthest railway station—Mildura—would be 10s. 6d. per ton.

The American railways, from whatever stand-point they are considered, are marvels of organization and efficiency. To save cost is an ever-pressing problem; but it is grappled with and partly solved. The expenditure of half-a-million is not reckoned with if an ultimate saving of a million can be effected.

Moreover, the American Railway Companies are enterprising in their efforts to build up agriculture. California is over 2,000 miles by rail from the crowded centres of the east. Yet in the fruit season, peaches, apricots, tomatoes, strawberries, rock melons, and vegetables are hauled from California to the eastern markets over elevations of 5,000 feet in the Rockies, and across 1,000 miles of desert. The whole train is precooled before starting, and carries refrigerated cars which are regularly iced throughout the journey. This feat might be compared

with the task of hauling perishable produce by rail from Port Darwin across the Australian desert to Melbourne.

It is recognised, however, that railways cannot go everywhere, so that there must be good roads to act as feeders to the railways. Much of the energy of farmers has been dissipated in heavy haulage. A great deal of the time and energy spent in hauling wheat over the sandy unmade roads in the Mallee areas of South Australia and Victoria, or the haulage of milk and cream over the tracks of Gippsland, could be spent in increased production on the farm if better roads were available. Victoria has led the way in systematic road construction by placing the responsibility for construction and maintenance of main roads in the hands of a Country Roads Board, and the valuable work done by the Board has been generally recognised. Much, however, remains to be done before our country roads are adequate for the needs of Victorian agriculture.

In the United States the Federal Government has recently interested itself in the development of good roads. It is admitted that the county system of road construction has been unsatisfactory. The counties issued bonds to build roads by contract, but they provided no organization to maintain them. The Federal Government now co-operates with the State Governments in highway construction. The Federal Government recently made an appropriation of £17,000,000, spread over five years, as a subsidy for road construction. It proposes to allocate this to the States on a £1 for £1 basis—

One-third of the money on the basis of length of roads,
One-third of the money on the basis of size of State,
One-third of the money on the basis of population.

Each State must, in addition, place its roads under the control of a State Highway Commission before it can secure Federal funds. The Bill has had a remarkable effect. Already during the past year more constructive highway legislation has been put on the statute-book than at any previous period of the nation's history.

Bulk Handling.

The whole of the cereal harvest east of the Rocky Mountains is handled in bulk, as contrasted with the bag system practised here. Not only wheat, but maize, oats, rye, and flax are handled in bulk.

The great advantages of the bulk handling scheme contrasted with the bag handling are: (1) saving in bags; (2) saving in labour; (3) time; and (4) it permits the proper grading of grain according to quality, and gives a premium to the careful grower.

One has merely to observe the remarkable rapidity with which cereals are loaded and unloaded at country and terminal elevators to be convinced that the system must effect a great national saving in man power, and that if a bulk handling scheme can be installed at a reasonable cost substantial benefits must accrue to the community. Wheat is often unloaded from trains at the rate of 10,000 bushels per hour, and delivered from the terminal elevators to the ship's hold at the rate of 25,000 bushels per hour.

Nearly 90 per cent. of the farms of America are worked by owners. In the East 80 acres is the normal size of a farm, in the Middle West 160 acres, and in the West 300 acres is the usual holding. The irrigation blocks vary in size, but usually run from 30 to 50 acres.

DIVERSIFIED AGRICULTURE.

The most striking and impressive feature of American agriculture, as contrasted with our own, is the extent to which its agriculture is diversified.

Wheat is our great staple crop and our export crop. The success or failure of the wheat crop to a large extent determines the financial condition of the country. But America is neither a one-crop country nor a one-stock country, but is a land with a great variety of crop production, and is equally strong in live stock production. Maize, cotton, hay, wheat, oats, lucerne, barley, flax, sugar, tobacco, and fruit are grown over enormous areas, each type of crop, however, being confined to the region in which it thrives best.

The eastern half of the United States is humid, the western half dry. The agriculture of the humid east is based on annual summer crops. Maize is the principal crop. In the arid west the agriculture is based on grazing, winter-grown crops, and irrigated summer crops.

Corn, or maize, is America's greatest crop. This is grown because the soil and climate suit it so well. I propose to give the production of a number of these staple crops in order to give you some idea of what a country the same size as Australia may produce when it is fairly on the way towards proper agricultural development. The maize crop of the United States amounts to 3,000,000,000 bushels.

Suppose this maize were placed in five-ton waggons, and placed end to end, then the line of waggons would extend for 50,000 miles—or twice round the globe. Eighty per cent. of this stupendous quantity is fed to stock. In addition to this 900,000,000 bushels of wheat are annually produced—nine times as much as we normally produce in Australia.

The oat crop amounts to 1,500,000,000 bushels—more than 100 times the quantity we produce in Australia.

The hay crop of America is immense. Last year it was 85,000,000 tons. This is about 25 times as much hay as is cut in the whole Commonwealth of Australia.

To visualize this much hay, imagine a stack of hay 7 yards broad and 7 yards high, stretching from here to London. The stack would be 12,000 miles long. That would represent the amount of hay cut last spring by the farmers of America. A stack extending from Melbourne to Adelaide would accommodate the Australian crop.

The cotton crop amounted to 16,000,000 bales. Cotton is one of the competitors of our Australian wool. The American farmers plucked by hand from the cotton plants of the South an amount of cotton ten times as great as the entire wool clip of Australia.

IRRIGATION.

Irrigation is extensively practised in the United States. Were it not for the harnessing of the rivers and their diversion over the arid soils of the West, it is certain that the Western States would be sparsely settled, and consist mainly of sheep and cattle ranches, rather than centres of compact settlement.

Considerably over 4,000,000 acres of land in Western America are now being irrigated, *i.e.*, more land is placed under irrigation than the whole area sown in Victoria to wheat, barley, oats and hay.

The art of irrigation in America was revived by the Mormons who settled at Salt Lake City in 1847. In the Rocky Mountain States they say three things conquered the desert—irrigated lucerne, sugar beet, and Brigham Young.

The most important crops grown under irrigation are—(1) Fruit, (2) lucerne, (3) sugar beet. The greater part of the irrigated fruit is grown in California. It is pre-eminently the great fruit State of America. The climate of California closely resembles northern Victoria—rainfall in winter, with dry summers and clear, sunny skies.

Nearly 1,000,000 acres of fruit are grown in California, and much of the produce is hauled over 2,000 miles by rail to market. Yet there is no form of agriculture which gives such assurance of reasonable profits as fruit-growing in California.

The one great crop in the irrigated areas is lucerne. Five million acres have been sown in the United States, all but 200,000 acres in the Western portion.

Lucerne is the great stock feed of the West for cattle, sheep, pigs and poultry.

On the whole the soils on which lucerne was grown appeared to me to be more porous than those of our Northern irrigation settlements. In the Imperial Valley, in Southern California, the soil is stiff in character, and greater care and skill is needed to get good returns.

Sugar beet is one of America's great staple crops. Three-fourths of the sugar-beet in the United States is irrigated. From the time when the pioneers of Utah purchased a sugar-beet factory from France in 1852 and hauled it by ox waggons from St. Louis on the Mississippi to Salt Lake City in the Rockies—a distance of over 1,000 miles—the industry has made enormous strides.

Last year the amount of sugar produced was 870,000 tons. Sugar produced from beets by white labour has been able to compete with cane sugar grown by black labour in the tropics.

One of the largest beet sugar companies in the world, the Great Western Sugar Company, erected sixteen factories in the Rocky Mountain States. Sugar beet culture has proved very profitable, both from the point of view of the farmer and from that of the Sugar Company.

The number of growers for the Great Western has increased from 739 to 5,400 in fourteen years. The dividends paid by the Great Western Company vary from 25 to 30 per cent. on a capital of £6,000,000.

I was greatly impressed with the sugar beet industry of America, and with its possibilities in Victoria. It is unfortunate that the pioneer sugar beet factory in Australia was established in a relatively dry portion of Gippsland, where the summer rainfall is insufficient to enable maximum crops to be grown.

Long experience and numerous trials in the United States have shown that to get profitable yields of sugar beet in America, rainfall, or irrigation water, approximating 20 inches, during the growing period of the crop, is essential. If irrigation facilities were provided at Maffra, the yields in average and dry seasons would be equal to the yields in the best years.

The development of irrigation offers a means whereby the production from the soil may be greatly increased.

After years of contentious discussion, the States of New South Wales, Victoria, and South Australia, and the Federal Government, have come to an agreement regarding the utilization of the Murray waters, and these Governments, acting co-operatively, propose spending £5,000,000 in providing a series of storages, and at the same time, by means of a system of locks, the river will be rendered navigable for a distance of over 1,100 miles.

What a remarkable prospect is opened up by a consideration of the possibilities of the Murray lands! The settlement at Mildura is an example of what can be done by the application of irrigation water in arid districts. Prior to the advent of irrigation Mildura was a sheep walk, supporting, at most, a few families on the whole area. To-day the 12,000 included in the settlement support in comfort a population of 6,000 souls, and the total production of the settlement is £600,000 per annum. Settlers are prosperous, and the settlement has a high standard of comfort, and reaps all the social and educational advantages of a compact and closely-knit community.

It would, perhaps, be extravagant to say that the one and a half million acres of irrigible land to be opened up in the Murray valley by the construction of new storages under the Murray Waters Act can be expected to equal Mildura in out-turn per acre, for Mildura confines itself to specialized fruits, for which there is but a limited demand at current prices. But these new lands may be expected to carry immense numbers of live stock, and will be similar to many of the prosperous irrigation settlements throughout Australia. Irrigation offers an ideal method of settling people in smaller areas than would be possible if the natural rainfall were to be depended on.

STOCK.

The live stock industries in the United States have been well developed. The live stock supported in 1915 were:—Cattle, 60,000,000; pigs, 68,000,000; sheep, 45,000,000.

One striking contrast between American and Australian practice is the extent to which systematic stock feeding is practised in America. Here in Australia sheep and cattle are merely grazed on natural pastures. The cultivation of forages for feeding stock is practised only in isolated instances. In the American States, however, the production of hay, grain and silage for feeding to like stock is regularly practised throughout the agricultural regions. Hand-feeding of stock at first necessitated in winter by the rigorous climate has now become the general practice throughout the year.

In the Western States, where there is a large area of range country, with a rainfall insufficient for the successful production of cereals, cattle are grazed on the plains and mountains and shipped to the corn belt to be fattened for the great packing centres. In the Southern States, the prevalence of cattle tick has hindered the expansion of the cattle industry.

In the east and north-eastern portions, the population is denser, and the pasture and feed pay better for dairying than for raising beef cattle.

The distribution of beef cattle in the United States varies with the availability of cheap feed and pasture. The greatest number of beef cattle is found in the western portion of the maize belt. Maize and hay

are cheapest in the Middle Western States, and the most profitable use for these crops is found in feeding and fattening cattle, which can better bear the cost of transportation than maize or hay.

The greater proportion of the dairy production of the United States is in the north-east section and the State of Wisconsin. This concentration is probably due to the proximity of large city markets, the cool summer climate which favours the production of products of high quality, and although the cool summer prevents the proper maturity of maize for grain, it permits its production for silage. Moreover, the climate of the north-eastern section has made it the most important hay region, and an assured market for this hay is secured by keeping dairy cows. The high rainfall, combined with the cool summer, promotes the maintenance of green pastures, which greatly reduces the work of feeding the cattle.

The Holstein is the predominant breed of dairy cattle in the United States. In smaller numbers are the Jerseys, Guernseys, and Ayrshires.

The American clearly recognises that the production of milk economically depends upon high producing cows and cheap home-grown feeds. No effort is spared to get high-producing cows, and during recent years numerous cow-testing associations have been formed in every dairy State of the Union.

These cow-testing associations work in close co-operation with the Agricultural Colleges and Agricultural Departments. The development of these cow-testing associations until they include every herd in the State, is one of the main features in the extension work of the colleges.

One striking feature in dairy farming practice is the extent to which pasturage is supplemented by hay and concentrated foods. Hand feeding is, of course, compulsory in the Northern States during winter on account of the low temperatures, but the Americans have carried hand feeding to an extent which would astonish the average dairy farmer in Victoria. During the winter, milch cows are fed usually on hay and silage. The basal ration for a 1,000-lb. cow is 35 lbs. of silage and 15 lbs. of hay (clover, timothy, or lucerne). But the American dairy farmer and the Experiment Stations have found out by practice and experimental investigation that, even if cows are fed with an abundance of clover hay and silage, the maximum yield of milk cannot be obtained without some grain and concentrates.

Cows like the Holstein, capable of giving 4-6 gallons per day, will not be able to manufacture these quantities of milk from hay or silage, because the bulk is too considerable. Consequently grain is fed with hay and silage usually at the rate of 1 lb. of mixed grain and concentrates (bran, maize, oats, oilmeal, gluten feed, brewers' grains) for every 3-4 lbs. of milk given in excess of 2 gallons per day.

The American farmer certainly knows how to raise cheap pork. He makes a profit out of pigs, even when prices are low and grain products high, by making extensive use of rape, lucerne, or clover pastures, and supplementing the grazing with grain rations.

The work of the Experiment Stations shows conclusively that the growing of pasture crops should go hand in hand with pork production. Lucerne is the most valuable of all such pastures, because of its high production of digestible nutrients, its vigorous growth and heavy yields, and its soil renovating qualities. The pastures are used for grazing

throughout the spring and summer. In all cases the grazing is supplemented either by maize or maize and tankage (meat meal from the packing houses). To reduce labour costs to a minimum, the maize and tankage are supplied in "self feeders," which provide a continuous supply of grain and meat meal to the pig, on the principle of the automatic feeders used in poultry houses.

Maize is the principal fattening food for pigs in the United States. The young pig requires a narrow ration—one part of protein to five parts of carbohydrates and fat. The grazing on lucerne or clover will supply the pig with an abundance of the cheapest of all proteins.

As the pig approaches marketable age, it requires a ration of one part of protein to eight or nine of heat and fat producing ingredients. Hence maize, which has a nutritive ratio of approximately 1 to 9, makes an ideal food for fattening.

In Canada, the production of bacon for the English market is a profitable industry. The Yorkshire, Tamworth, and Berkshire breeds are used almost universally. The climatic conditions in Canada are unfavorable for maize, but very favorable for barley production. Hence the Canadians produce bacon by grazing pigs on clover, rape, and lucerne pasture, and using barley as the supplementary grain feed. In this way they are able to compete with the bacon produced from the cheap maize in the United States.

The extension of the pig industry in Victoria could be greatly assisted by the more extensive use of pastures for grazing purposes, the more extensive use of Cape barley as a supplementary grain feed, and by using the labour-saving "self-feeders" in association with the pastures.

Agricultural Education.

I stated that the advance of nations in prosperity and power depended partly on the natural resources they possessed, and partly on the ability of the people to exploit those resources.

Progress in the development of the material resources of a nation depends rather on the trained ability of its leaders than on that of the rank and file. The Americans, therefore, have promoted higher education in all its branches in order to be furnished with a supply of able scientists, engineers, chemists, organizers and administrators, on whose activity the future of the nation largely depends.

The Puritans who founded the American colonies were keenly interested in national education. The fathers of the Republic believed that only a well-informed and well-educated nation could be happy, prosperous and free, and they always acted in accordance with that conviction. From the earliest days the expenditure of the Americans on education has been prodigious, and it has been increasing more and more rapidly in recent years.

Last year the nation spent £122,000,000 on education—twice as much as Great Britain spent on the Army and Navy the year before the war. The United States spent on education as much as Great Britain spent prior to the war under the Budget on its Army, Navy, whole Civil Service, public education, national insurance, and interest and sinking fund on the National Debt.

The willingness to provide liberally for education, no matter whether it be elementary, high school education, or the training of the artisan,

the agriculturist, or the man of commerce, seems to spring from the conviction that a well rounded and comprehensive system of education, freely available for all citizens, is essential for the maintenance and well-being of a Democracy. The Americans also hold that an efficient system of agricultural education is an absolute necessity for national progress. They contend that money spent on agricultural education and development is a wise national investment which is repaid to the nation many times over in the form of increased national prosperity.

The Americans have the reputation of being a business-like and practical nation, requiring a dollar's worth of result for every dollar of expenditure; but on no form of education have the individual States or the Federal Government spent money so freely as on agricultural education.

The bill for agricultural education, research, and extension approximates £12,000,000. This is a large sum to spend on agricultural education. What, it may be asked, do the Americans expect in return for this expenditure? Let me briefly set out their objective in agricultural education, and how they propose realizing it.

What is the aim of agricultural education in the United States? I asked many of the leading agricultural authorities this question, and they were all in general agreement upon the fundamental aims. Dr. Davenport, one of America's foremost agriculturists, put the general view very clearly. He said that the fundamental purpose of agricultural education is the development of agriculture as a productive occupation, and of the agricultural people as an important part of the social and political fabric.

Development is the central thought in educational activity, and the development of American agriculture to its highest possible limit, both as a business and as a mode of life, is the purpose for which the colleges and experiment stations were founded and supported by the public. The development of agriculture until it shall be profitable, productive, permanent, until the rural districts are comfortable, and the rural people are educated—these are the specific aims of American educationists.

Agriculture must be profitable because farming is a business, and the first and fundamental step in its development is to put it on a paying basis. The colleges and experimental stations have devoted their main efforts to increasing the profits of farming. In the past farming was not a capitalized industry, and failure was almost impossible. But from now on farming is to be a capitalized occupation, and failure will be relatively easy, for the new discoveries of science, while they tend to establish the business on a sounder basis, do not make it easier for novices and men of low capacity.

It is not enough for America that its agriculture shall be profitable; it must also be productive. For while America took 300 years to get a population of 5,000,000 of people, it has increased its population by over 100,000,000 during the last 90 years.

If population increases during the next 50 years at the same rate as it has during the past 25 years, then America will have a population equal to China inside of 50 years. It is the business of agriculture to learn how to feed this rapidly increasing population, and feed them well. Unless American agriculture can rise to its task, then within the life-time of children born to-day, scarcity of labour will be a matter of

history, and abundance of cheap food a tale that is told by the grandfather dozing in his dotage.

America, too, must evolve a permanent agriculture—a thing no country has yet succeeded in establishing. For no race of people has succeeded in feeding itself except at the expense of the fertility of their own or some other country.

The Chinese are often pointed out as a people who have solved the problem of a permanent agriculture and a permanent food supply, yet reliable authorities affirm that on the highlands of China there are regions once peopled, and now abandoned, where for stretches of 10 miles no man lives. China, with its population of 400 to the square mile, must presently either move, adopt new methods, or starve.

So much for what may be called the business side of agriculture—an agriculture reasonably profitable, highly productive, and certainly permanent. What now on the human side? What is to be the development of the farmer as a man to match the development of his business as an occupation?

Agriculture is not only a business, but it is a mode of life as well, and if it is to be successful in the latter, it must afford its devotees the same comforts of life as are obtainable in other occupations. This has not hitherto been possible, but its realization is becoming every day more probable, for one of the distinctive developments in American farm life is the establishment of comforts and conveniences.

The rural telephone, adequate lighting and water systems, the use of shelter and ornamental trees, the development of the farm garden, and the installation of toilet facilities are becoming common features in the farm homes of America. The farmer has hitherto provided himself with all sorts of machinery and ingenious mechanical devices to cheapen production, and make labour easier for himself, his hired help, and even his animals.

In the meantime the wife is given no real domestic conveniences and no comfortable home—she lives and scrapes along for the day when the family will build its home in town and "have the conveniences."

Many a man has turned his back upon the farm that made his wealth, and stripped the land of its fertility to build in the town the home to which the farm was entitled. This tendency had become so widespread in America as to excite public alarm, and no one topic is featured in the findings of the Country Life Commission more than the abandonment of the farm at the stage of house building.

Farming and pioneering started off together, and the life of the pioneer farmer was hard, not because he was a farmer, but because he was a pioneer. Nature was unsubdued, men and women were poor, and life was hard indeed when necessities were counted as luxuries. But those days are over on real agricultural lands, and farming is coming into its own; but it will not come fully into its own until farmers learn to build comfortable houses for themselves and their children, and instal some of the conveniences that are regarded as essential in every city home. That is what is meant by saying the country must be comfortable.

Finally, the men and women who live upon the land and till the soil—it is really the nation's soil and not theirs—should be given an

education which will make them efficient in a business way, and which will make them good citizens as well.

These, then, are the main objects of agricultural education in America—the development of agriculture until it shall be profitable, productive, permanent, until the country districts are comfortable, and the rural people educated.

Dr. Davenport says that if this development of agriculture were merely the concern of the farmers we might leave them to provide for it themselves, or let matters rest as they are. But in the final analysis the development of agriculture is a public question. The farmers are interested, of course, and for selfish reasons; but even if they were not interested the nation should still insist, for public reasons, that agriculture be developed to the utmost. Farmers will reap the first advantages of such development, but they can realize no advantages that are not shared by the whole community.

The development of agriculture, then, is a matter of vital public concern, and any money spent on such development is not an outlay, but an investment in the safest bank on earth—the soil of the Commonwealth, and the people on whom the nation must depend for its management.

What have been the results of the expenditure of America on agricultural education? Primary production for the fifteen years prior to the war had been increasing to the value of £90,000,000 annually, and £90,000,000 per annum extra production is a fine dividend to realize on the amount spent for agricultural education.

Let me briefly review the forms of agricultural education. Agricultural education, taken in the broadest sense of the term, may be said to cover all those activities undertaken for the promotion of sound and profitable agriculture of a country.

These may be classified as (1) instructional work, (2) investigational work, (3) extension work. By instructional work we mean all the formal teaching of agriculture from the primary schools to the University.

Instructional Work.

The investigational work involves the discovery of new facts and principles pertaining to agriculture.

By publicity or extension work is meant the conveyance and dissemination of agricultural information to those who are unable to take advantage of the formal teaching of the schools and colleges.

The three great institutions are (1) the Agricultural College, (2) The Experiment Station, (3) the Federal Department of Agriculture.

The agricultural colleges were born in the throes of the Civil War—at a time when the very existence of the nation was at stake—when doubt and pessimism seemed to reign supreme.

They have had a chequered career. At first they attracted no students. To-day they are crowded. Forty years of failure and twelve years of dazzling success is the epitome of the history of the colleges.

Last year 130,000 students were registered in the 53 colleges of agriculture in the United States, and of these 16,000 were undergoing a four years' course for the degree of Agricultural Science. It would take me too long to trace the history of the colleges—but success came

when the Federal and State Governments began to invest money liberally in the colleges, and provide them with proper equipment, and high-class specialists as teachers.

Twenty years ago the students came to the colleges fresh from the cornfields with no prior training. Now, however, they must have a high school training before they are allowed to enter the colleges.

The curriculum has gradually developed in such a way as to secure a unique blend of the vocational and non-vocational in varying proportions, with enough of both to turn out an efficient business man without sacrificing his education as a citizen.

The authorities aim at making a good farmer, but they aim, too, at making the student a good citizen as well.

Ninety-five per cent. of the students who graduate from the colleges either go on the land, or take up some form of agricultural work—teaching, investigational work, or extension work. Of those who do not graduate practically all return to the land. In either case failures are almost unknown.

For those who cannot attend the full courses, short courses extending from two weeks to two months are held, so that they who desire to increase their knowledge of agriculture may do so. These courses are given by specialists, and thousands of farmers attend them every year. At Ohio there were over 3,000 farmers in attendance at the College of Agriculture at the time of my visit.

Domestic Science.

A feature of most American Colleges of Agriculture is the provision made for the teaching of domestic science and home economics.

Within the college is a group of buildings devoted exclusively to the training of young women in domestic science.

In the American view, both men and women should be equally interested in farm life, and if training is necessary for the one it is equally essential for the other. Consequently regular four-year courses of instruction are provided for women just as courses in agriculture are provided for men.

Ninety-five per cent. of the women of America become home-makers sooner or later in their career (some of them become home-breakers, too!). For that reason, home-making, with all that it implies, forms the principal subject of instruction for women. The object is to teach the principles underlying the proper administration of the household, and to study foods, hygiene, nutrition, dietetics, textiles, clothing and household management.

The equipment is usually very complete. Laboratories are fitted with gas stoves, and gas, coal, wood and electric ranges. Each girl is provided with a kitchenette, where her work in cooking is done. A practice cottage is associated with every course in home economics. This is usually a six-roomed house, furnished and equipped to accommodate five or six students and an instructor in charge. The furnishings are simple and typical of the average American home. The purpose is to provide an opportunity for students to gain practical experience in managing a household. The students are responsible for the planning, preparation, and serving of the meals, marketing and household accounting, and cleaning and laundering of the household

linen. Emphasis is laid on the importance of a proper system of keeping household accounts. Each girl becomes in turn hostess, cook, waitress, maid, and laundress of the cottage.

A feature of the course is the efforts made to reduce drudgery in the farm home to a minimum by the use of various types of labour-saving devices, and by the wise planning of the kitchen and kitchen equipment. The number of students taking courses in home economics range from 300 to 1,000, according to the size of the college and the number of its rural population.

It is related that the President of the Cornell University, when a school of home economics was first mooted, protested on the ground that it would mean that cooks would have to be admitted to faculty meetings. But to-day the president is one of the strongest supporters of home economics.

The old idea that anybody can farm and that anybody can cook and manage a home has well nigh disappeared, and with it the idea that farming means ploughing only, and that the activities of the home are fully represented by the making of hot scones.

The schools of home economics have dignified labour by sending forth from their halls not merely cooks, but educated women who, because of their knowledge and skill in the practices and principles of the arts of the home, are able to use them as a means of expression for their best endeavours.

The Americans believe that for the young man who takes up farming an agricultural education is especially necessary. He faces more difficult problems than any preceding generation of farmers. He must go on to land many times more valuable than his father first occupied, and at the same time this land has lost much of its fertility. He must fight against more destructive insect and fungus pests and animal diseases than any farmer preceding him. He faces new problems in management and marketing. He must face these problems not only with experience, but with science as his ally, and intelligence broadened by the best education.

In addition to the 53 colleges, agriculture is being taught in 4,000 high schools and 100,000 elementary schools. America began her agricultural instruction in the colleges and universities. When a supply of highly-trained teachers of agriculture was available, agricultural education was extended to the high schools. Then, when the elementary teachers had received a training in agriculture, the subject was brought into the elementary schools.

INVESTIGATIONAL WORK—THE EXPERIMENTAL STATION.

Agricultural investigation and research work is regarded both in the United States and Canada as a necessary and vital part of any system of agricultural education, and must form the basis for framing a sound policy for future agricultural development.

The American Experiment Stations were founded by the Federal Government in response to a desire for aid in solving problems in American agriculture, and to perfect methods of improving agricultural practice. There are 60 of these experiment stations, and the average expenditure on each is £18,400 per annum.

Some idea of what a single experiment station has accomplished during the last century may be obtained by considering the results obtained at Wisconsin.

It is demonstrable that the added wealth of the State of Wisconsin each year, as a result of the activities of the experiment station, is many times the whole appropriation made by Wisconsin for agricultural education.

Of the seven tests widely used in dairying, six originated at the Wisconsin station. The Babcock fat test, invented in 1890, furnished a simple means of paying for milk on the basis of quality and for detecting fraud. It saved the factory system of butter-making from ruin. This test permits of a more careful control of factory processes than formerly, thus saving more than half of the fat formerly lost in the skim milk produced in creamery operations. For Wisconsin alone this amounts annually to a saving of over 1,500,000 lbs. of butter. The greatest service of the Babcock fat test, however, has been in making possible the improvement of dairy cows by eliminating unprofitable animals, and thus giving a scientifically accurate foundation for dairying.

The Wisconsin curd test detects the quality of milk as to taints. The casein test, invented in 1909, registers the casein content, which is of importance in determining the proper value of milk for cheese-making.

Many improvements in dairy processes relating to the pasteurization of milk, curing of cheese, have originated at this station.

These tests and experiments made at the Experiment Station, which together form the most important contribution ever made to the science of dairying, and the work of the Wisconsin Dairy School, have enabled Wisconsin to gain the first rank among the States of the United States in the production of both cheese and butter.

Since the Babcock fat test was discovered, the value of the dairy products of the State has increased from £4,000,000 to £16,000,000 per annum. It cannot be doubted that a considerable percentage of this increase has been due to the campaign of investigation and education which has been carried on by the University.

One of the greatest possible improvements in agricultural production is through the substitution of improved seed for scrub varieties. Beginning about 1898, efforts were made to develop seeds adapted especially to Wisconsin soil and climatic conditions.

New varieties of maize, barley, and oats have been evolved at the station, and have added millions of bushels annually to the yields of Wisconsin fields.

Wisconsin has now achieved leadership in the production of dairy products, cheese and butter, among the American States. Despite many disadvantages, she now occupies first place among the States for output of dairy products. That Wisconsin's dairy production has quadrupled during the last twenty years is due chiefly to the leadership and work of the dairy school of the experiment station. In addition to the output of dairy products, Wisconsin's cereal yield is considerable. Though only two-thirds the size of Victoria, and though the northern half of the State is mostly poor land in need of drainage, Wisconsin, besides producing £16,000,000 worth of dairy produce, raises 100,000,000

bushels of oats, 70,000,000 bushels of maize, and 25,000,000 bushels of barley.

EXTENSION WORK.

The most significant feature in agricultural education in the United States during recent years is the development of the co-operative extension or publicity service in each State of the Union.

The object of the extension work is to disseminate as widely as possible the mass of information which has been accumulated as a result of the investigations of the experiment stations and agricultural colleges.

Since the experiment stations were founded, there has been gained by patient investigation sufficient exact and detailed knowledge of soils, crops, and farm animals to enable the total wealth from agricultural production to be greatly augmented if the information could be widely disseminated and brought home to the last farm and the last farmer.

There are many farmers who regularly secure double and treble the yields of their neighbours. A wire fence frequently divides the grower of a 30-40 bushel crop from the grower of a 10-15 bushel crop. To encourage the many to do what the few are doing is the objective of the extension or publicity work.

The principal forms of extension work are (1) the County Agent Scheme, (2) Home Demonstration Agents, (3) Boys and Girls' Clubs.

The experience of the last fourteen years has demonstrated fully the value of the county agent as a means of bringing to the people on the farms the results of experience and scientific investigation. Nearly every one of the 3,000 counties of the United States has a county agent—a trained agriculturist located in the district—who works in co-operation with local organizations to advance the agricultural interests and improve agricultural practice in the county.

Conclusion.

We have much to learn from America. It is a country of great natural resources—and a country in which the Government and the people have shown wise and energetic activity in developing those resources.

Three great contributing causes for this development stand out in bold relief. They are:—

(1) The resources of a country can only be fully exploited by a large and increasing population. The American Government has, therefore, encouraged immigration in every possible way. This immigration has not lowered the standard of living or reduced wages, because as fast as new immigrants arrived they were absorbed by the rapidly growing primary and secondary industries, which have been fostered in every way possible, even by the imposition of a high tariff, until the industries were able to meet foreign competition.

(2) The productive capacity of the workmen has been increased in every possible way, but especially by the adoption of labour-saving machinery and the development of cheap power. Thus the output per workman has been greatly increased. This applies both to agriculture and industry. The output of produce *per capita* is greater than that of any other nation.

If we look around the world we invariably find that where production per man is greatest, there, too, are the richest merchants and the richest

workmen. In India, where individual production is small because little machinery is used, the classes are poor.

High production alone can raise wages very considerably, and high wages need not cause dearness. If doubling or trebling of wages is accompanied by doubling or trebling of production, the commodities made by high wages need not suffer. Henry Ford has realized the value of this principle. He pays the highest wages and produces the cheapest motor cars.

One of the greatest dangers we have to face in Australia is the spread of the insidious doctrine of slackening of output. Nothing will bring the community more rapidly to a condition of poverty and unrest.

The nation is a great co-operative society. Some men must produce food, some must make boots, and some clothes, &c. If all workers limit the output they may conceivably raise wages, but there will be little food, fuel, boots and clothes to go round. On the other hand, if all the workers produce with the help of the most perfect machinery vast quantities of clothes, fuel, food, the goods will have to be consumed, and they can only be consumed by the many. High production all round leads to high consumption all round.

As far as agriculture is concerned, we want to develop production and cheapen it by better transportation, cheaper freights, better roads, more extensive use of agricultural machinery, and a higher efficiency among the great mass of farmers.

(3) The development of leadership. Whatever may be the drawbacks of American higher education as contrasted with European prototypes, there is no question that it develops great engineers, architects, chemists, scientists, organizers, leaders, and administrators, on whose activity the future of the nation largely depends. America during the last ten years has spent more on higher education than any other nation, and she is now beginning to reap the benefit in the remarkable developmet of her industries and her agriculture.

Australia has undoubtedly great natural resources. We could undoubtedly raise sufficient foodstuffs to support a population equal to the present population of America. A bold policy of immigration, developmental railways, improved transportation, liberal land settlement laws, provision of good roads, extension of irrigation facilities, development of water storages, opening up of new markets, development of minor industries—all these will mightily aid our agriculture—bring new areas under cultivation, and develop this country. These are material aids to settlement and profitable production. But something more is required to make the agriculture of the country permanent, profitable and productive.

You may increase the agricultural output of a State by all these methods, and you may temporarily stimulate production by fixing prices, bonuses, and other artificial aids; but the only way to secure a genuine and permanent increase in agricultural output is to improve the farming methods of the country, and apply the teaching of science to its agricultural practice.

That is the clear lesson of experience in all the great agricultural countries of the world.

We can treble our production of wheat in Victoria at least double our output of dairy products, and at the same time maintain our live stock industries. Iowa, Kansas, Wisconsin have blazed the trail and suggested the way. But to do this will require greater efficiency on the part of the man on the land, more complete knowledge of the principles underlying agriculture, and a greater perfection in the technical processes of agriculture.

The degree to which we can progress towards intensified agriculture depends largely on the personal efficiency of the average farmer, and the extent to which that efficiency can be increased.

The establishment of a comprehensive system of agricultural education must form the basis of any scheme for agricultural development and agricultural advancement.

The farmers of the future, *i.e.*, the boys and youths of the present day, must be provided for at the schools, and colleges, and the University. The farmers of the present generation must also be provided for through the extension or publicity agencies I have described.

Finally a comprehensive system of investigational work must run parallel with the work of instruction and extension in order to elucidate new facts, which will form the basis for the future development of agriculture.

One important fact must not be overlooked. A long time is required to realize on all educational work. Some years must elapse before the full effects of what is done for agricultural education to-day will be reflected in increased production.

This is the psychological moment for developing our system of agricultural education.

Agriculture is enormously productive, and money expended in its development is money invested. Every bushel per acre added to Victoria's wheat fields means at least £500,000 extra income to the State. Every disease and insect and fungus we learn to control saves enormous wealth to the country. Every contribution to our knowledge of soil management and stock management is of great public benefit.

Great countries have always developed their education systems in times of adversity. History shows that all great nations have been stimulated to increased activity in education under the stress of war. The American Colleges of Agriculture and the United States Department of Agriculture were born in the midst of civil war. France, after the war of 1870, trebled her expenditure on education with what result we see to-day. When Schleswig Holstein was torn from Denmark, the Danes developed their systems of education with such success that they have become the world's object lesson in agricultural advancement.

Our expenditure on the war has already assumed large and oppressive dimensions. The interest on increasing loans will have to be met and the loans ultimately redeemed. We must look to increased production from the soil to pay for the growing interest charges and the redemption of the principal.

A long range policy for agricultural education is required—a policy which will look beyond the immediate present and which will map out the requirements of the State for the next ten years, and make provision for its steady accomplishment.

RED POLL DAIRY CATTLE.

Report on the Departmental Herd, Season 1917-18.

Although the herd records this year do not show any sensational figures, the average of 7,776 lbs. of milk and 341 lbs. of butter fat cannot but be regarded as highly satisfactory.

Sickness interfered with the old champion "Muria," nevertheless she made over 406 lbs. of fat from 7,293 lbs. of milk, testing 5.57, in 266 days.

"Birdseye," probably the most consistent cow in the herd, again gave the respectable yield of 8,330 lbs. of milk and 437 lbs. fat. "Birdseye" is one of the few cows in the State to average over 400 lbs. of fat in four successive nine-month testing periods. Her value as a breeder as well as a yielder is fully demonstrated by the fact that her first daughter, "Avesia," as a heifer last year gave 340 lbs. butter fat, and this year, on her second calf, gave over 1,000 gallons of milk and 414 lbs. butter fat. "Birdseye's" second daughter, "Opticia," heads the list of heifers for the year under review, with 9,257 lbs. milk, and 410 lbs. butter fat in 333 days. This heifer has since been forwarded to New Zealand as one of the exchanges for the Friesian herd, which the Department acquired from the New Zealand Government. "Birdseye's" yearling bull was a winner at the recent Melbourne Royal Show, and, in acquiring him to head his newly-established Red Poll herd at Corriedale Park, Wagga, Mr. J. F. Guthrie gets a remarkable combination of type, form, size, and hereditary milk-producing capacity.

The family record of "Virginia," dam of "Birdseye," is perhaps worth reproducing. It is as follows:—

Virginia.	La Perla. (By Prince of Wales) (Not tested.)	La Reina (By Tabacum).
lbs. Milk.		lbs. Fat.
6,362 (1st calf)		254
5,510 ..		221
6,500 ..		282
8,229 ..		357
10,252 ..		456
		5,070 (1st calf) 261
		6,712 .. 344
		6,677 .. 319
		8,028 .. 378
	Birdseye (By Tabacum).	Avesia (By Nicotine).
	lbs. Milk.	lbs. Fat.
	4,440 (1st calf)	257
	6,542 ..	358
	8,522 ..	474
	9,146 ..	597
	8,330 ..	436
		lbs. Milk. lbs. Fat.
		7,406 (1st calf) 340
		10,030 .. 414
		Opticia. (By Nicotine).
		lbs. Milk. lbs. Fat.
		9,251 (1st calf) 410

Previous reports emphasized the beautiful dairy form of "Netherlana." This year, she heads the herd, with the fine record of 12,722

lbs. milk and 509 lbs. butter fat. "Mongolia," an ideal type of dual-purpose cow, has topped the 1,000-gallon mark, making 459 lbs. of fat. "Cutty," of whom big things are expected, has crept up to third place on her second calf, with 9,849 lbs. of milk and 461 lbs. fat; and during her current lactation period, has made up to 3 lbs. of butter per day. "Santa Clara," *ex* "Cuba," bids fair to eclipse her dam's best record by yielding 10,182 lbs. milk, which gave a test of 4.64, and yielded 473 lbs. of fat, on her second calf.

The past season saw the completion of the yields from twenty-one heifers, having the splendid average of 7,384 lbs. of milk, testing 4.31 per cent., and yielding 319 lbs. fat (364 lbs. commercial butter). The true test of successful stock breeding is for the owner to produce stock superior to his original purchases. If the records just mentioned may be taken as a guide, the Department of Agriculture is deserving of credit for success in this respect. The first ten heifers have the wonderful average of 8,698 lbs. of milk, and 376 lbs. of fat. "Morocco," by "Ganymede," yielded 10,401 lbs. of milk and 390 lbs. of fat in 365 days, being nearly 3 gallons a day all the year round. "Latakia," a "Nicotine" heifer *ex* "Turka," was a week over three years old when she dropped her first calf, and is consequently mentioned in the cow class. Her position of seventh, with 9,026 lbs. milk, 4.85 test, 436 lbs. fat, is an excellent performance, and besides her splendid record, she possesses beauty of form.

When the tables of our most successful dairy sires (all breeds included) are written, the name of "Nicotine," the Red Poll sire at the Werribee Research Farm, will occupy a prominent place. His fourteen heifers, which came into profit this year, have the fine average of 7,361 lbs. milk, 4.33 test, 320 lbs. fat, and 364 lbs. commercial butter.

YIELDS OF "NICOTINE" HEIFERS.

Season 1917-18.

Name of Heifer.	Days in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Dam of Heifer.
Opticia	333	9,251	4·42	410	467	Birdseye
Samotina	365	8,212	4·70	388	442	Samorna
Lallah	342	8,164	4·67	382	435	Persica
Kabanka	365	9,070	4·16	378	431	Cuba
Iris	362	7,621	4·78	365	416	Lily
Tabeltina	365	8,589	4·10	353	403	Tabelta
Anglia	352	8,257	4·01	331	377	Britannia
Azora	365	7,779	4·10	320	365	Atlanta
Dainage	273	7,125	4·02	287	327	Bullion
Kickahoe	332	6,430	4·30	277	315	Tuckahoe
Briar	315	6,158	4·42	272	310	Pipio
Tropic	298	5,903	4·36	258	293	Equatoria
Laranaga	329	5,548	4·18	232	264	Havana
Aiken Bond ..	365	4,921	4·44	220	250	Crimson Thread
Average, 14 heifers	340	7,361	4·33	319·5	364	

The next annual report will probably include heifers by the imported sires "Belligerent" and "Longford Major," the latter being now 84 lbs. over the ton in weight.

Odd cows have been culled during the year, "Sumatra," who became a non-breeder, selling for £31 in the fat stock market.

All the members of the herd are in splendid fettle, and it is probably one of the best conditioned herds in the State.

The British Live Stock Annual for 1918 mentions the great strides the breed is making in England, more especially on the dairy side.

A very strong Council of Red Polled Cattle Breeders was formed during Royal Show week, and the Australasian Red Polled Cattle Breeders' Association, springing, as it has, from the successful efforts commenced ten years ago by the Department of Agriculture to popularize the breed, has every prospect of a successful future.

YIELDS AND RETURNS OF THE GOVERNMENT HERD OF RED POLL DAIRY CATTLE.

Season 1910–11.

Cows (2nd Calf).

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Bullion	283	40½	7,730	4·2–5·0	356·71	406½	17 16 8
Virginia ..	283	40½	6,362	3·8–4·6	254·75	290½	12 14 9
Havana ..	283	40½	5,750	3·8–4·6	229·97	262½	11 10 0
Kentucky ..	245	35	5,310	4·0–4·6	225·98	257½	11 6 0
Cigarette ..	238	34	5,040	4·0–4·6	211·61	241½	10 11 7
Beulah	135	19½	3,970	4·2–4·9	200·44	228½	10 0 5
Average for 6 ..	244½	30	5,693½	4·3	246·59	281	12 4 11

Heifers.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Vuelta	270	38½	5,560	7·0–7·8	405·14	461½	20 5 1
Connecticut ..	283	40½	6,182	4·2–4·6	269·06	306½	13 9 0
Carolina ..	283	40½	5,700	4·2–4·8	253·14	288½	12 13 1
Muria	283	40½	5,480	4·2–6·2	240·70	274½	12 0 5
Cuba	283	40½	5,260	4·2–4·8	231·89	264½	11 11 11
Pennsylvania ..	270	38½	4,610	4·0–4·4	189·75	216½	9 9 9
Average for 6 ..	278½	34	5,465	4·7	269·94	300·12	13 4 11

Season 1911–12.

Cows.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Vuelta	289	41½	7,750	5·2–8·2	485·1	553	24 5 1
Connecticut ..	283	40½	6,730	4·6–6·4	364·0	415	18 4 0
Bullion	305	43½	6,940	4·8–6·2	344·0	392½	17 4 6
Beulah	278	39½	6,460	4·9–6·4	342·0	390½	17 3 7
Cuba	304	43½	7,015	4·4–8·4	337·8	385	16 17 9
Cigarette ..	291	41½	6,480	4·0–5·6	285·9	326	14 6 0
Sumatra ..	293	42	6,660	4·0–5·0	284·2	324	14 4 1
Kentucky ..	277	39½	6,690	4·0–4·8	277·7	316½	13 17 8
Muria	286	41	5,800	4·5–7·0	275·7	314½	13 15 8
Pennsylvania ..	318	45½	6,340	4·0–5·2	271·9	310	13 12 0
Carolina ..	226	32½	5,800	4·0–5·0	254·3	290	12 14 4
Virginia	277	39½	5,510	3·9–4·6	221·7	252½	11 1 9
Havana	262	37½	5,350	3·8–4·5	215·3	245½	10 15 4
Average for 13	283	40½	6,355	4·7	304·6	346½	15 4 7

Season 1912-13.

Cows.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £ s. d.
Muria	256	36½	5,780	4·5-7·3	314·96	359	15 15 0
Bullion	239	34	6,490	3·8-6·8	296·90	338½	14 16 10
Egypta	295	42	6,581	3·7-5·2	283·5	323	14 3 6
Virginia	259	37	6,500	3·6-5·7	282·56	322	14 2 6
Cigarette ..	273	39	6,810	3·9-4·8	278·56	317½	13 18 6
Connecticut ..	320	45¾	6,100	4·0-7·0	277·55	316½	13 17 10
*Vuelta ..	263	37½	6,650	3·5-5·3	273·31	312	13 13 9
Cuba	251	36	6,280	3·9-5·4	269·11	306¾	13 9 1
Kentucky ..	267	38	6,249	3·4-4·4	256·00	291¾	12 16 0
Havana ..	258	37	6,060	3·5-5·5	252·95	288¼	12 12 11
Sumatra ..	230	33	5,670	3·7-5·5	238·37	171¾	11 18 4
Pennsylvania ..	230	34¼	4,910	3·8-5·9	215·09	245¼	10 15 0
Europa	324	46¼	4,590	3·6-7·1	201·13	229¼	10 1 1
Carolina ..	274	39	4,450	3·6-6·5	198·30	226	9 18 3
Average for 14 Cows ..	267	38	5,942	4·85	259·94	295	12 19 10

* Suffered from eye accident for a considerable period.

Heifers.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £ s. d.
Goldleaf ..	287	41	6 590	4·1-5·3	316·50	360	15 16 6
Birdseye ..	285	41	4,440	3·9-8·0	256·75	292½	12 16 9
India	267	38	5,231	4·1-6·2	238·37	271½	11 13 1
Persica	252	36½	4,100	4·6-7·7	218·69	249½	10 18 8
Turka	191	27½	3,590	4·6-5·9	178·27	203¼	8 18 3
Mexicana ..	210	30	3,830	4·0-5·1	171·58	195½	8 11 6
Regalia ..	338	48¼	3,380	4·4-6·0	161·58	184¼	8 1 0
Cabana	273	39	3,370	4·0-5·4	153·23	174½	7 13 3
La Suelta ..	241	34½	2,660	4·3-8·2	134·23	153	6 14 3
Average for 9 Heifers ..	260	37	4,132	5·3	203·24	232	10 3 3

Season 1913-14.

Cows.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Estimated Butter (lbs.)	Values. £ s. d.
Cigarette ..	328	46¾	9,414½	4·12	388·25	442½	19 8 3
Muria	296	42½	7,487½	5·08	380·25	433½	19 6 3
Birdseye ..	297	42½	6,542½	5·48	358·75	409	17 18 9
Virginia ..	304	43½	8,229	4·33	356·75	396½	17 16 3
Bullion	297	42½	8,177½	4·29	350·75	400	17 10 9
Sumatra ..	330	47½	7,605	4·26	323·75	368½	16 3 0
Vuelta	236	43½	7,723½	4·14	320	364½	16 0 9
Connecticut ..	278	39¾	7,166	4·47	318·25	362½	15 18 3
Persica	293	42½	6,954½	4·57	318	362½	15 18 0
Kentucky ..	288	39½	7,904½	3·96	313·25	357	15 13 3
Goldleaf ..	277	41	8,008	4·49	310·25	353½	15 10 3
Mexicana ..	293	41	6,773½	4·56	309·25	352½	15 9 3
Cuba	287	41½	6,624½	4·47	296·25	337½	14 16 3
Europa	302	43	6,273	4·60	289·25	329½	14 9 3
Egypta	288	41	6,724	4·13	277·75	316½	13 17 9
India	245	35	6,150	4·36	268·5	306	13 8 6
Havana ..	240	34½	6,364½	4·15	264·25	301½	13 4 3
Turka	289	41½	5,534½	4·69	259·75	296	12 19 9
Adana	260	37	4,249½	5·30	225·5	257	11 5 6
Pennsylvania ..	249	35½	5,160	4·4	212·25	242	10 12 3
Regalia	207	42½	4,444	4·50	200·25	228½	10 0 3
Carolina ..	231	33	4,322½	4·62	200·25	228½	10 0 3
Averages of herd of 22 cows ..	284½	40½	6,669½	4·49	297·25	338½	14 17 3

Season 1913–14—*continued.*

Heifers.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £ s. d.
Atlanta	300	42¾	5,505½	4·90	277	315¾	13 17 6
Germania	259	51¼	4,218½	4·74	199·75	227¾	9 19 9
Arctica	294	42	3,768½	5·16	194·5	221¼	9 14 6
Netherlana	293	41¾	4,551½	4·18	190·5	217¼	9 10 6
Hispana	290	41¼	3,944½	3·95	155·75	177¾	7 15 9
Melanesia	276	39¼	3,690½	3·97	146·5	167	7 6 6
Averages for 6 heifers ..	302	43¼	4,279½	4·48	194	221	9 14 0

Season 1914–15.

Cows.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £ s. d.
Muria	365	52	14,972	5·9	884·6	1,007·94	44 4 7
Persica	351	50	9,607	4·9	479·94	547·13	23 19 11
Cuba	337	48	10,464	4·5	478·14	545·07	23 18 1
Birdseye ..	321	45¾	8,522	5·5	473·79	540·12	23 13 9*
Bullion	321	45¾	10,928	4·3	468·99	534·64	23 8 11
Virginia	344	49	10,252	4·4	456·76	520·13	22 16 9†
Pennsylvania ..	348	49¾	10,607	4·1	437·42	498·65	21 17 5
Sumatra	290	41¼	9,232	4·6	431·49	491·89	21 11 6
Egypta	327	46¾	10,646	3·9	418·55	477·14	20 18 6
Mexicana	282	40¼	8,641	4·6	399·75	455·71	19 19 9
Europa	347	49½	8,765	4·4	387·11	441·30	19 7 1
Goldleaf	362	51¾	8,415	4·4	377·67	430·54	18 17 8
Philliptina ..	284	40½	9,829	5·0	343·33	391·39	17 3 4
Vuelta	239	34	7,560	4·4	338·28	385·64	16 18 3
Connecticut ..	259	36¾	8,378	4·7	325·48	371·04	16 5 6
Turka	279	39¾	6,395	4·9	316·07	360·31	15 16 0*
Ardath	332	47¼	6,261	4·8	302·91	345·31	15 2 10
Asiana	279	39¾	5,923	4·9	292·01	332·62	14 12 0
Netherlana	292	41¾	6,903	4·2	291·78	332·62	14 11 9
Havana	325	46¼	7,001	4·0	285·86	325·88	14 5 10†
Cameo	303	43¼	5,536	5·1	285·60	325·58	14 5 7
Alpina	286	40¾	6,995	3·9	276·86	315·62	13 16 10
Atlanta	252	36	5,635	4·7	266·90	304·26	13 6 10
Hispana	365	52	6,574	3·6	241·69	275·52	12 1 8
Kentucky ..	281	40	6,068	3·9	239·51	273·04	11 19 6†
India	244	34¾	4,578	4·9	225·30	252·75	11 5 3
Averages of herd of 26 cows ..	308	43¾	8,084¼	4·6	374·03	426·39	18 14 0

* Was sick a few days. † Suffered from lameness.

Heifers.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £ s. d.
Pipio	334	47¾	6,802	4·8	326·37	372·06	16 6 4
Tennessee ..	311	44¼	6,706	4·2	282·88	322·48	14 2 10
Samorna ..	365	52	5,490	4·9	271·76	309·80	13 11 9
La Reina ..	342	48¾	5,070	5·1	261·96	298·63	13 1 11*
Mongolia ..	301	43	5,799	4·2	244·95	279·24	12 4 11
Sylvia	301	43	4,897	4·7	235·79	268·80	11 15 0
Tuckahoe ..	322	46	4,874	4·7	206·38	235·27	10 6 4
Averages of herd of 7 heifers ..	325	46¼	5,591	4·6	261·44	298·04	13 7 1

* Calved two months prematurely.

Season 1915-16.

Cows.

Name of Cow.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values, 1s. lb. Fat. £ s. d.
Birdseye ..	365	52	9,146	6·53	597	683	29 17 0
Netheriana ..	365	52	11,506	4·26	490	560	24 10 0
Violet III. ..	365	52	9,172	4·66	427	488	21 7 0
Philliplna ..	365	52	8,213	4·87	400	457	20 0 0
Connecticut ..	357	51	8,313	4·80	399	456	19 19 0
Persica	346	49	7,800	5·00	394	451	19 14 0
Lily	365	52	8,525	4·59	392	448	19 12 0
India	365	52	8,556	4·56	390	445	19 10 0
Cuba	324	46	8,400	4·55	382	437	19 2 0
Kentucky ..	338	48	9,893	3·88	382	437	19 2 0
Mexicana ..	310	44	8,421	4·44	374	427	18 14 0
Picotee	365	52	8,490	4·36	371	424	18 11 0
Vuelta	328	47	9,130	4·00	368	420	18 8 0
Sumatra ..	322	46	8,135	4·45	362	414	18 2 0
Ardath	365	52	7,330	4·84	355	406	17 15 0
Primrose League (Imp.) ..	365	52	8,060	4·39	353	403	17 13 0
La Reina ..	329	47	6,712	5·13	344	394	17 4 0
Bullion	317	45	7,504	4·40	330	377	16 10 0
Pennsylvania ..	278	40	8,236	4·00	330	376	16 9 0
Mongolia ..	283	40	7,483	4·33	323	369	16 3 0
Pipio	317	45	6,274	5·09	319	365	15 19 0
Britannia ..	329	47	7,637	3·94	301	343	15 1 0
Goldleaf ..	248	35	6,665	4·43	295	337	14 15 0
Samorna ..	365	52	6,198	4·75	294	336	14 14 0
Asiana	279	40	5,933	4·90	292	332	14 12 0
Egypta	303	43	7,136	4·02	287	328	14 7 0
Cameo	285	41	6,036	4·72	285	325	14 5 0
Alpha	344	49	7,094	3·99	283	323	14 3 0
Sylvia	303	43	5,286	4·84	256	292	12 16 0
Tennessee ..	347	50	5,914	4·17	246	281	12 6 0
Africana ..	303	43	5,082	4·72	240	274	12 0 0
Tasmania ..	325	46	5,112	4·52	231	264	11 11 0
Canada	275	39	4,918	4·07	200	228	10 0 0
Average for 33 cows ..	330	47	7,525	4·54	342	391	17 2 0

Heifers.

Name of Heifer.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values, 1s. lb. Fat. £ s. d.
Carribea ..	365	52	7,142	4·35	310	354	15 10 0
Japana	357	51	7,788	3·63	283	322	14 3 0
Serbia	365	52	6,092	4·45	271	309	13 11 0
Itala	365	52	6,346	4·09	260	297	13 0 0
Oceana	365	52	6,247	4·11	256	292	12 16 0
Russia	365	52	6,413	3·96	254	290	12 14 0
Panama ..	288	41	5,997	4·23	254	290	12 14 0
Ontario ..	365	52	6,059	4·15	251	286	12 11 0
Soudana ..	346	49	5,486	4·54	249	284	12 9 0
Pacifica ..	365	52	4,979	4·88	243	278	12 3 0
Laurel	325	46	5,554	4·86	228	257	11 6 0
Barbery ..	359	51	5,387	3·72	200	228	10 0 0
Congo	296	42	4,449	4·21	187	213	9 7 0
Average for 13 heifers ..	348	50	5,995	4·03	242	277	12 2 0

Season 1916-17.

Cows.

Name of Cow.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £ s. d.
Muria	365	52	12,101	5·52	669	763	33 9 0
Sumatra ..	365	52	11,569	4·46	516	588	25 16 0
Panama ..	365	52	10,830	4·33	469	535	23 9 0
Tennessee ..	310	44	9,107	4·26	389	443	19 9 0
Ontario ..	365	52	9,686	3·99	387	441	19 7 0
Soudana ..	365	52	8,788	4·38	385	439	19 5 0
Primrose League (Imp.) ..	365	52	8,698	4·08	356	405	17 16 0
Europa ..	353	50	7,899	4·43	350	399	17 10 0
Congo	357	51	8,252	4·28	349	398	17 9 0
Pipio	287	41	7,887	4·42	348	397	17 8 0
Aslana ..	357	51	7,356	4·71	346	395	17 6 0
Phillipina ..	298	43	7,295	4·73	345	394	17 5 0
India	365	52	8,065	4·27	344	392	17 4 0
Jspana ..	365	52	10,101	3·40	343	391	17 3 0
Europa ..	295	42	7,618	4·49	342	390	17 2 0
Mexicana ..	273	39	8,549	3·98	341	389	17 1 0
Velveteen (Imp.)	365	52	7,887	4·25	336	382	16 16 0
Vuelta ..	273	39	7,914	4·18	330	377	16 10 0
Tasmania ..	358	51	7,576	4·30	326	371	16 6 0
Carribea ..	304	43	7,719	4·20	324	370	16 4 0
La Reina ..	299	43	6,677	4·78	319	364	15 19 0
Cuba	259	37	7,508	4·17	313	357	15 13 0
Goldleaf ..	251	50	7,311	4·19	307	350	15 7 0
Britannia ..	308	42	7,309	4·30	301	344	15 1 0
Sylvia	261	37	6,180	4·80	297	338	14 17 0
Egypta ..	303	43	7,293	4·03	294	335	14 14 0
Arpina ..	286	41	7,440	3·84	286	326	14 6 0
Americana ..	319	46	5,925	4·80	272	310	13 12 0
Australiana ..	338	48	5,652	4·77	270	308	13 10 0
Canada ..	286	41	6,688	4·02	269	307	13 9 0
Egypta ..	282	40	6,825	3·90	266	304	13 6 0
Barbery ..	280	40	6,638	3·99	265	302	13 5 0
Laurel ..	323	46	6,257	3·70	232	264	11 12 0
Tabelta ..	330	47	4,867	4·42	215	245	10 15 0
Africana ..	243	35	4,482	4·59	206	235	10 6 0
Hispana ..	270	39	5,656	3·61	201	230	10 1 0
Zealana ..	201	29	2,817	3·65	103	117	5 3 0
Averages, 37 cows ..	316	45	7,580	4·28	325	370	16 5 0

Heifers.

Name of Heifer.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values. £ s. d.
Gallipoli ..	365	52	8,074	4·44	359	409	17 19 0
La Belle France ..	365	52	7,765	4·61	359	409	17 19 0
Goldlace ..	319	46	7,502	4·61	346	395	17 6 0
Tonga ..	338	48	7,397	4·61	341	389	17 1 0
Avesia ..	340	49	7,406	4·59	340	388	17 0 0
Cutty	358	51	7,012	4·76	334	381	16 17 0
Mahratta ..	347	50	6,043	5·61	330	387	16 19 0
Aridia	275	39	4,217	4·89	206	235	10 6 0
Averages, 8 heifers ..	338	48	6,927	4·73	328	374	16 9 0

Season 1917-18.

Cows.

Name of Cow.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values, 1s. per lb. Fat. £	s.	d.
Netherlana ..	365	52	12,722	4·00	509	581	25	9	6
Santa Clara ..	365	52	10,182	4·64	473	538	23	13	0
Cutty	365	52	9,849	4·88	461	525	23	1	0
Mongolia ..	365	52	10,217	4·47	459	523	22	19	0
Baltica ..	365	52	10,241	4·46	457	521	22	17	0
Birdseye ..	332	47	8,330	5·24	437	498	21	17	0
Latakia ..	359	51	9,026	4·85	436	497	21	16	0
Avesia ..	365	52	10,030	4·12	414	472	20	14	0
Serbia	316	45	9,436	4·36	411	469	20	11	0
Mavia	266	38	7,293	5·57	406	463	20	6	0
Tonga	318	45	9,182	4·33	398	454	19	18	0
Persica ..	365	52	7,686	5·05	390	443	19	10	0
Lily	365	52	9,253	4·16	385	439	19	5	0
Sylvia	317	45	7,950	4·78	381	434	19	1	0
La Reina ..	324	46	8,028	4·71	379	431	18	19	0
Aleutia ..	345	49	8,318	4·45	371	423	18	11	0
India	337	48	8,608	4·17	359	410	17	19	0
Soudana ..	365	52	8,411	4·22	356	405	17	16	0
Tasmania ..	351	50	8,624	4·09	353	403	17	13	0
Asiana	357	51	7,356	4·71	346	395	17	6	0
Velveteen ..	328	47	8,357	4·06	340	387	17	0	0
Mongolia ..	296	42	7,977	4·19	335	381	16	15	0
Bullion ..	235	33	7,892	4·38	333	380	16	13	0
Congo	365	52	7,621	4·18	319	363	15	19	0
Gallipoli ..	303	43	7,618	4·17	318	362	15	18	0
Britannia ..	251	36	7,815	3·90	306	349	15	6	0
Hollandia ..	365	52	6,447	4·65	302	344	15	2	0
Malaysia ..	313	45	6,548	4·59	301	343	15	1	0
Argentina ..	273	39	7,716	3·75	290	330	14	10	0
Aridia	289	41	6,505	4·32	281	321	14	1	0
Pacifica ..	273	39	6,253	4·46	279	318	13	19	0
Africana ..	292	42	5,802	4·78	278	316	13	18	0
Russia	306	44	6,864	4·01	276	314	13	16	0
Empire	314	45	5,655	4·79	271	309	13	11	0
Colnage	321	46	6,348	4·22	268	305	13	8	0
Violet III. ..	273	39	5,736	4·60	266	303	13	6	0
Alpina	280	40	7,118	3·53	251	286	12	11	0
Barbary	301	43	6,695	3·52	236	268	11	16	0
Oceana	313	45	5,210	4·02	210	239	10	10	0
Russia	273	39	4,672	3·81	178	203	8	18	0
Carriben ..	280	40	4,137	4·17	173	197	8	13	0
Average, 41 cows	321	46	7,776	4·38	341	389	17	1	0

Heifers.

Name of Cow.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values, 1s. per lb. Fat. £	s.	d.
Opticia	333	48	9,251	4·42	410	467	20	10	0
Syiph	365	52	8,485	4·61	391	446	19	11	0
Morocco ..	365	52	10,401	3·74	390	444	19	10	0
Samotina ..	365	52	8,242	4·70	388	442	19	8	0
Lallah	342	49	8,164	4·67	382	435	19	2	0
Sumonta ..	365	52	8,908	4·28	381	435	19	1	0
Kubanka ..	365	52	9,070	4·16	378	431	18	18	0
Iris	362	52	7,821	4·78	365	416	18	5	0
Tabeltina ..	365	52	8,589	4·10	353	403	17	13	0
Anglia	352	50	8,257	4·01	331	377	16	11	0
Azora	365	52	7,779	4·10	320	365	16	0	0
Jamaica ..	365	52	7,791	4·10	320	365	16	0	0
Nyanza	318	45	6,888	4·45	307	350	15	7	0
Colnage ..	273	39	7,125	4·02	287	327	14	7	0
Nickahoe ..	332	47	6,430	4·30	277	315	13	17	0
Briar	315	45	6,158	4·42	272	310	13	12	0
Tropic	298	43	5,903	4·36	258	293	12	18	0
Orinoco ..	295	42	5,956	4·28	255	295	12	15	0
Laranaga ..	329	47	5,548	4·18	232	264	11	13	0
Silken Bond ..	365	52	4,921	4·44	220	250	11	0	0
Nictitana ..	273	39	3,587	5·04	181	207	9	1	0
Average, 21 heifers ..	338	48	7,334	4·31	319	364	15	19	0

APPLE CULTURE IN VICTORIA.

(Continued from page 658, Vol. XVI.)

By J. Farrell, Orchard Supervisor.

Apple Root Borer (*Leptops Hopei*)—*continued.*

The trap is made by placing on the stem of the affected tree, say, 9 inches above the ground, a strip of zinc, tin, or other such material about 6 inches wide and of sufficient length to encircle the butt and slightly overlap. The material should be cut in such a way as to form a crinoline when placed on the stem and nailed in position. The upper rim should fit closely on the bark, and the slope of the cone may form an angle of about 45 degrees to the vertical or line of the stem. When the zinc is being cut into the required shape a circular hole about an inch in diameter is made near the upper edge to act as an opening close to the bark when the crinoline is in position. A canister about 5 inches long and 1½ inches in diameter, made of perforated zinc with a close-fitting lid on top and a light trap-door at the bottom, is fixed over the aperture. The beetles, both male and female, on emerging from the ground, climb the stem, but as their upward movement is impeded by the crinoline they find the aperture and enter the trap. The beetles should be collected from the traps every second or third day and destroyed by immersion in boiling water, or they may be burned. A mode employed by some orchardists to destroy the captured insects is to simply decapitate them and throw their bodies on the ground. This method is to be deprecated, because the impregnated females, which have arrived at the egg-laying stage prior to being killed, often after death, emit their eggs on the soil. Weather conditions being favorable, the young grubs hatch freely from these, and descend to the roots.

The light zinc collars or bands used on the stems during recent years afford a simpler and less expensive means of preventing the beetles from climbing up the trees. The collar is about 5 inches wide, and the ends overlap each other by about 2 inches; it fits closely on the bark, and is made fast by a nail driven through the overlap into the stem. Although agile and proficient climbers, the Root Borer beetles are incapable of surmounting the smooth surface of the new zinc. Owing to the corrosive influence of the air on the zinc the surface after a time becomes somewhat rough. A foothold is thus offered to the insects, but this may be destroyed and a fairly smooth surface maintained by lightly rubbing the zinc downwards with fine emery paper, or by painting the surface with whiting, which, especially when dry, yields to the pubescence of the feet. The beetles, persisting in their attempts to climb over the bandages, linger around the butts of the stems, whence they may be collected by hand and destroyed as explained. The most disastrous results caused by root borer are those which follow the immediate planting of pest-infested virgin land after being cleared. At least two years should elapse from the time of clearing such land until planting commences, and it should be cropped in the interim to insure the pest's eradication.

Generally speaking, when orchards show the first signs of infection, only a few trees in different parts of the areas are found to be

attacked. On the presence of the pest being discovered in these parts the infested trees and those around them should be carefully treated in the way suggested, in order to prevent the spread of infection, and obviate the necessity of more extensive and expensive treatment, which invariably follows early neglect. As this pest is fairly amenable to treatment under the principles of isolation, much of the devastation caused in many orchards could have been considerably reduced had the trouble received more careful attention during the early stages of infection.

Plate 183.—Emperor Alexander Apple Tree which has been attacked by root borer.

Plate 183 illustrates the apparent effect on the framework above ground as a result of the roots being attacked by the borers. The tree is of the Emperor Alexander variety, and ten years old. The decaying points of the branches indicate that the "die-back" has considerably advanced, and the presence of the borers is further evidenced by the succulent growths which appear near the base of the leaders.

The maintenance of the naturally high sap pressure is essential to the production of uniformly strong and healthy growth in every part

of the branch system. But, when sections of the bark, cambium, and young wood of the roots beneath them are destroyed by the larvæ, the pressure is probably relieved, as, during the periods of growth, the wounded parts exude liquid matter. One of the functions of the root caps and the bark is to maintain the purity of the sap, which probably becomes contaminated during the process of absorption by soil acids and possibly deleterious bacteria entering through the wounds.

Certain varieties, like Rome Beauty, Yates, &c., do not show the effects of borer for a considerable time, while others, such as Jonathan, London Pippin, &c., collapse after a relatively short period of infection. This may be attributed chiefly to the influence of scion on stock. When the main roots of the Rome Beauty, Yates, &c., become so seriously damaged as to prevent sap movement, tufts of small roots are produced at the points above the wounds, and these supply much of the necessary nutriment. Occasionally the main roots of the Jonathan, London Pippin, &c., produce a few fibrous ones in the manner described, but the influence of these varieties on their stocks is not sufficient to induce the growth of enough of these fibrous roots to sustain the trees. Although much has been done by the orchard supervisors and others interested in the suppression of this pest to clear up its life history, the length of time involved in the larval stage is still unknown. Its ravaging propensities call for more effective remedial measures than those at present employed, and here is a wide field for further investigation and experiment. These should include fighting the borer with its natural parasite (*Perilitus leptopsi*, Viereck), discovered by Mr. H. W. Davey, orchard supervisor.

WOOLLY APHIS (*Eriosema lanigera*).

Of the apple pests which live by suction there is none more widely distributed, destructive, and difficult to keep in check than woolly aphis. Every part of the tree which is not blight-proof is liable to be attacked, but the roots are now protected by the employment of resistant stocks, of which Northern Spy is in most general use. The work of controlling the blight was much more difficult when non-resistant stocks were used, because, no matter how free the branch system was kept, the insects on the roots, as well as weakening the tree, afforded a sure source of continual infection.

The presence of woolly aphis in an orchard is usually first indicated by the appearance of a small number of the insects on the soft bark of the succulent young growths, on the callousing bark of the amputation marks on the leaders, laterals, and spur growths made by the secateurs at the last pruning operation, or on the bark wounds of the stems and main arms caused by swingle-bars, or through the careless handling of cultivating implements. The matured bark being impenetrable, the insects insert their probosces in the young soft rind and suck out the juices on which they live. Usually when the first infection is of a serious nature, the laterals of the current year's growth are attacked. Weather conditions continuing favorable, the insects multiply rapidly, and form colonies on the underneath side of the laterals. When spraying treatment is neglected during the first year of infection, and the colonies of

insects are allowed to operate undisturbed, the bark cracks at the end of the period of growth.

The Jonathan is one of the varieties most liable to be attacked in this manner, and Figs. 1 and 2, sections of young laterals, in Plate 184, depict this condition. Further neglect during the second year induces the development of abnormal woody excrescences by encouraging unnatural and excessive sap movement in the affected parts. Fig. 3 is a two-year-old Jonathan lateral, and the longitudinal section of bark and wood was cut away at (*a*) to show the development of the protuberance, and thus depict this condition of the specimen.

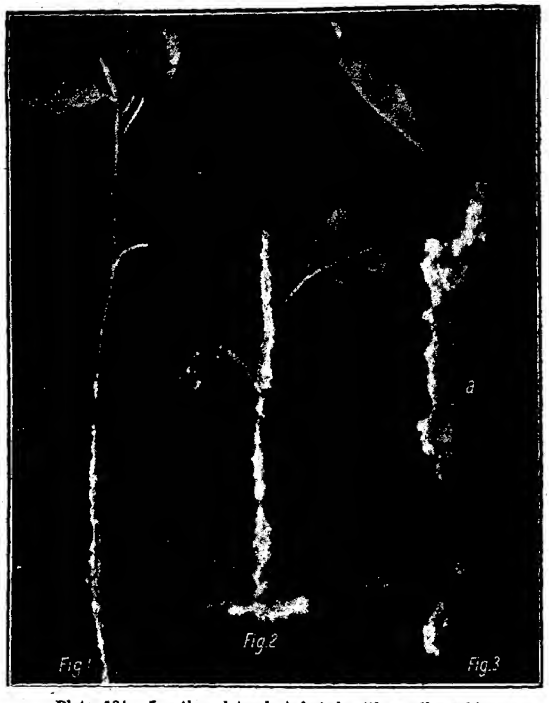

Plate 184.—Jonathan laterals infested with woolly aphis.

The bark on the irregularly shapen swellings being incapable of maturing while the insects are present offers them a favorable feeding ground, and if this condition be allowed to continue for a number of years, the branches assume the appearance of the section of the Reinette de Canada tree, which appears in Plate 185. The deep crevices in the warts afford shelter for many of the insects, and the work of destroying these by spraying is rendered difficult.

Owing to the apparent inability of many fruit-growers to realize the importance of dealing drastically with pests when first discovered in the orchard, the writer would like to emphasize the desirability of giving closer attention to this work, and there is no destructive parasite to which these remarks more fittingly apply than woolly aphis. As the aphides live by suction, it is impracticable to poison their food in the same manner as that of the jaw-feeders, but the former being soft-bodied, they quickly succumb to the searching influence of caustic liquid substances brought into contact with them. Many such spray mixtures

Plate 185.—Section of Reinette de Canada tree infested with woolly aphis.

have been employed in the past, but it is unnecessary to discuss here their relative effectiveness, or otherwise. Suffice to say, that during recent years experience has taught that these mixtures may safely be reduced to two kinds—tobacco wash during the period of vegetation, and red oil emulsion while the trees are in the dormant state. This refers to the necessary spraying treatment, when the attack is general, but, when the aphides occupy only comparatively few isolated positions, as already described, they may be effectively dealt with by painting the parts with kerosene, or eucalyptus oil, which experiments have proved to be quicker in action, and even more deadly in effect.

The tobacco wash, being a vegetable product, is not injurious to the foliage, but, being sufficiently caustic in its nature, acts as an efficacious remedy against the aphides, and for these reasons it is used during the period of growth. Old leaf tobacco or stems are used at the rate of about 1 lb. to 3 gallons water. The tobacco is steeped in the water for three or four days, then the mixture is violently agitated, and the solution carefully strained off into the spraying vat. Soap added at the rate of about 1 lb. to every 20 gallons of the tobacco water increases its killing powers, makes it more adhesive, and leaves a heavier deterring residual deposit on the bark. The interstices in which many of the insects reside, as well as the woolly covering on their bodies, protect them, and render the application of the solution as a spray under high pressure essential. By this means the woolly covering is destroyed, and the insects, smeared with the solution, are washed out of the crevices and cast on the ground to die. The nozzle should be specially directed at the parts where the insects are most plentiful until thoroughly drenched. If it be found that to complete the eradication of the pest from the orchard, a second application is necessary, this should not be neglected.

Of the oils used against woolly aphis during the dormant stage of the trees, red oil is regarded as the most efficacious. It is sprayed on the trees in the form of an emulsion, and at strength ranging from 1 in 15 to 1 in 25, and soap is made the combining agent. To make 1 gallon of oil into a stock solution, 1 lb. of hard soap, or its equivalent of soft soap, is boiled in 2 gallons of water until it is dissolved. Then the oil is poured in, and the mixture put into the bucket spray-pump and forced through the nozzle back on itself, until emulsified, when water may be added to bring the solution to the strength desired. Should the oil show a tendency to separate, this may be prevented by adding a little crystallized carbonate of soda solution, and by keeping the mixture well agitated. Spraying with red oil emulsion may be commenced as soon as the leaves have fallen, and continued while occasion demands it; but as the Bordeaux mixture is applied in early spring, the interim should be as long as possible, so that a comparatively active residual deposit of the former may not be present to impair the efficiency of the latter spray.

Trees should not be sprayed for woolly aphis with red oil, especially at the ordinary strength, after the leaves appear. This refers more particularly to those which have become debilitated through being water-logged, or owing to the attack of root borers, or when they have become the hosts of fungi, especially *Armillaria mellea.*

Plate 186, illustrating a Rokewood tree affected by woolly aphis, and weakened by root borer as well, clearly shows the evil effects of late spraying. This variety is one most subject to woolly blight, which largely attacks the fruit spurs. The strong oil emulsion injuriously affected the young foliage, as well as the extensive areas of tender bark on the numerous interstiched and developing excrescences. The tree was sprayed the year before being photographed. The main leaders have all been killed, but the basal growths, which supervened on root borer infection, were not injured.

Although Gargoyle and other prepared soluble oils make good insect destroyers, the most generally satisfactory results are obtained from the

use of ordinary red spraying oil, when emulsified in the orchard, as explained.

Lime sulphur makes a good winter wash. A strong solution is effective against aphis and scale insects, and, by generally cleaning up the bark, prepares the trees to receive the first spray for black spot.

RED SPIDER (*Tetranychus telarius*).

These destructive little spiders, or red mites, as they are commonly termed, do much damage to apple trees, if permitted, through neglect of

Plate 186.—A Rokewood tree almost killed by a red oil spray after the foliage had appeared.

spraying, to infest the foliage. The eggs are comparatively large, and of a reddish-brown colour, and are deposited in great numbers in sheltered positions on the bark during autumn. The insects hatch out when the weather becomes fairly warm, and as the young leaves expand in the spring. The larvæ are at first of a greenish-brown colour, but become a brilliant red when the adult stage is reached. Most of the

insects live under their webbing on the back of the leaves, but many, in the different stages of development, infest the upper surface as well. They make numerous punctures in the epidermis of the leaves, through which the juice is abstracted by means of their sucking organs. The trees are thus deprived of much of their nutriment, and many of the leaf stomata are destroyed; this greatly disorganizes the process of sap elaboration, and militates against its equitable distribution. As the season of growth advances, the vitality of the leaves becomes correspondingly impaired, creating a most unfavorable condition for the maturing apples on the trees, as well as operating against the proper development of fruit buds for the succeeding year.

The best time to deal with red spider is while it is in the egg stage, and, as this occurs during the dormant period, red oil emulsion may be used with good effect. A strong solution may be used at this time, and the spray can be applied when the leaves have fallen. Tobacco water and soap solution make an effective spray against the insects on the leaves. The nozzle requires to be directed upwards when spraying, so as to drench the under side of the leaves, where the spiders are usually most numerous.

SAN JOSE SCALE (*Aspidiotus perniciosus*).

In San Jose Scale the fruit-growers have another formidable and destructive pest, which, since its introduction into Australia, has become widely distributed. It was probably introduced to this country on nursery trees, and by this means also it spread through the States of the Commonwealth and to New Zealand. The careless selection of buds and scions is also responsible for its appearance in so many parts of the State, while, in an infested area, birds afford the most likely means of locomotion from orchard to orchard, and from tree to tree. The larvæ become numerous on infested trees at the expiration of the period of latency. At this time probably numbers of these attach themselves to the bodies of birds visiting the trees, and crawl off on to the branches of others subsequently visited. The scales, which protect the insects, being small, circular, flat, and almost the colour of the bark, are, except to the practised eye, difficult to detect, especially if the infection be only of recent origin and slight. When the insects appear on the fruit, however, their identification is simple, as the pink spots caused by the larvæ, and on which the scales rest, indicate their presence.

The photograph of the ripe London Pippin apple in Plate 187 illustrates this condition, the dark circular spots represent the pink markings, in the centres of which the young scales appear as grey specks. Similar colouring of the bark occurs where the scales rest, but the surface of the coloured part not being as extensive as that on the fruit, it cannot, except in cases of severe infection, be seen until the scale is removed. The colouring in the spot begins to appear when the larva inserts its proboscis in the bark or fruit, as the case may be, and develops while the sucking out of the juice continues.

Trees or portions of trees badly infested with scale soon assume a sickly appearance, the bark becomes rough through the action of the insects, and if it be sliced off its general unhealthiness is suggestive of sap contamination. Red oil is very effective against San Jose Scale, yet its eradication from an orchard proves difficult. This is owing to

the rapidity with which these insects multiply. If an occasional small number escape contact with the spray, serious infestation again quickly follows. The oil emulsion, 1 in 15, may be used as soon as the leaves have fallen, with a second application later, if necessary. The best time to spray is while the scales are young, and, by commencing at the fall, advantage is taken of this condition, and ample time is afforded for the satisfactory completion of the work during the dormant period.

In 1909 the writer discovered that about 50 old apple trees in one corner of a 10-acre orchard in a certain fruit-growing locality were infested with this scale, the other orchards in the district being free from the pest. As soon as the leaves had fallen, the whole of the orchard was sprayed with red oil emulsion, 1 in 15, and the infested

Plate 187.—London Pippin Apple showing San Jose Scale.

trees received a second application at the same strength later. The following year it was seen that a small number of the scales on the old trees had survived the spraying ordeal. These were then grubbed out and burned, and the remainder of the orchard was again sprayed with the 1 in 15 emulsion. Frequent careful inspections since have failed to reveal the presence of the scale in this or the other orchards in the district. When this pest becomes more widely distributed through a fruit-growing district, however, the greater difficulty experienced in keeping it within reasonable bounds, or accomplishing its eradication, is mainly due to the growers' lack of maintaining a uniformly drastic method of treatment.

(To be continued.)

STANDARD COWS.

Report for Quarter ended 30th September, 1918.

Of the 96 cows which completed their term, 91 qualified for certificates Several cows otherwise due for publication have had to be omitted owing to failure on the owner's part to honour the understanding to register in their respective herd books.

Individual returns are as follow :—.

W. K. ATKINSON, Swan Hill. (Shorthorn.)

Completed since last report, 5. Certificated, 5.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Daphne XIII.	Not yet allotted	5.10.17	273	19	8,290	3·45	286·30	175	326½
Blanche Rose X. ..	,,	16.10.17	273	20½	8,106	3·65	296·15	175	337½
Cherry V.	,,	21.10.17	273	11	5,769	4·07	234·87	175	267½
Dairymaid 26th ..	,,	22.10.17	273	20	6,469	4·07	263·61	175	300½
Morven Rose VI. ..	,,	1.12.17	273	26½	10,624	4·06	431·70	250	492½

J. BAKER, Gheringhap. (Red Poll.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Karong Daisy	Not yet allotted	22.10.17	273	10½	4,038	4·57	184·69	175	210½

DR. S. S. CAMERON, Hawthorn. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Pride of Rocklands ..	Not yet allotted	14.12.17	273	16	7,003	5·0¼	353·00	250	402

C. FALKENBERG, Elliminyt. (Jersey.)

Completed since last report, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Trixie	Not yet allotted	1.11.17	273	10½	3,527	5·17	182·50	175	208
Silver Queen II. of Taringa	,,	1.11.17	273	9½	3,386	5·19	175·67	175	200½

DEPARTMENT OF AGRICULTURE, Werribee. (Red Poll.)

Completed since last report, 9. Certificated, 8.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Serbia	Not yet allotted	10.10.17	273	18	10,036	4·05	406·58	250	463¾
Asiana	,,	18.10.17	273	13	7,875	4·25	334·74	250	381¾
Europa	,,	19.10 17	273	15	8,436	4·27	360·11	250	410¾
Bullion	,,	21.10.17	273	9	6,223	4·12	256·62	250	292¾
Mahratta	,,	23.10.17	273	16	6,277	4·58	287·48	250	327¾
Ontario	,,	10.11.17	273	10	7,015	4·33	304·06	250	346¾
Pacifica	,,	17.11.17	273	13	6,023	4·37	263·30	250	300¾
Netherlana	,,	11.12.17	273	21¼	8,412	4·12	346·31	250	394¾

GEELONG HARBOR TRUST, Marshalltown. (Ayrshire.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Rose of Sparrovale ..	3906	9.10.17	273	20	6,186	4·58	282·86	175	299¾
Princess Edith of Gowric Park	2876	28.11.17	273	12	7,561	4·28	323·53	250	368¾

W. C. GREAVES, Monomeith. (Ayrshire.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Fidget of Warrook ..	2341	4.10.17	273	4	7,414	4·11	304·44	250	347
Grace Darling of Warrook	2909	24.10.17	256	4	7,028	4·08	287·04	250	327¾
Verona of Warrook ..	Not yet allotted	21.11.17	273	9	7,398	4·10	303·71	175	346¼

T. HARVEY, Boisdale. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Daisy V. of Holmwood ..	Not yet allotted	14.10.17	273	13	5,568	4·93	274·36	175	312¾
Lady Marge IV. ..	4101	21.12.17	273	19	6,294	6·30	396·40	250	452

S. CULLIS HILL, Heidelberg. (Jersey.)

Completed since last report, 2. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter
				lbs.	lbs.		lbs.	lbs.	lbs.
Lotina's Magnet ..	Not yet allotted	17.9.17	253	4	4,516	4·80	216·87	200	247½

A. JACKSON, Glen Forbes. (Jersey and Ayrshire.)

Completed since last report, 5. Certificated, 5.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Jersey—									
Moonlight	Not yet allotted	26.9.17	273	9½	4,658	5·02	234·06	175	286½
Mystery XIV. of Melrose	452 C.S.J.H.B.	28.9.17	273	20	9,681	4·69	454·68	250	518½
Graceful Duchess XI. ..	394 C.S.J.H.B.	3.10.17	273	22	8,314	6·47	538·20	250	613½
Maitland's Canary ..	Not yet allotted	9.10.17	273	6	4,065	6·17	250·78	175	286
Ayrshire—									
Princess Mary II. of Strachan	4136	16.10.17	273	15½	8,033	4·01	324·61	250	370

A. W. JONES, St. Albans, Geelong. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Dolly I. of St. Albans ..	Not yet allotted	13.10.17	*233	17½	4,520	5·99	270·83	175	308½
Queenie of Holmwood ..	,,	15.12.17	273	14	5,886	5·78	340·05	250	387½
Lady Grey V. of St. Albans	,,	21.12.17	273	11	5,253	5·35	281·01	175	320½

* Sold before completion of test.

AGRICULTURAL HIGH SCHOOL, Leongatha. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Sunset Star	Not yet allotted	26.10.17	273	18	6,498	5·38	349·52	175	398½

C. G. KNIGHT, "Tarnpirr," Cobram. (Jersey.)

Completed since last report, 6. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Idyll's Ideal	2096	25.9.17	273	13¼	6,089	5·00	334·83	250	381¼
Madam Melba	Not yet allotted	27.9.17	273	17	6,181	5·91	365·55	175	416¼
Romany Girl	,,	18.10.17	273	18½	6,213	5·86	366·17	175	417½
Royal Rose	2585	5.11.17	273	21	7,668	6·09	466·90	250	532½
Tiny	Not yet allotted	18.11.17	273	20	5,982	6·45	385·85	175	439¾
Mystic	,,	22.11.17	273	18	5,842	5·70	332·87	175	379¼

LEACH BROS., Binginwarri. (Jersey.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Charming Girl	319 C.S.J.H.B.	25.9.17	273	26	7,211	5·23	377·05	200	429½
Bluebell III.	561 C.S.J.H.B.	26.9.17	273	19½	6,381	5·06	322·82	175	368
Lotus	447 C.S.J.H.B.	14.10.17	273	23½	8,948	4·31	385·98	250	440
Mayflower	463 C.S.J.H.B.	25.10.17	273	25½	8,575	4·78	409·54	250	467

C. G. LYON, "Banyule," Heidelberg. (Jersey.)

Completed since last report, 11. Certificated, 11.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Maitland's Petal III. ..	Not yet allotted	2.10.17	273	11¼	4,604	5·56	255·85	175	291¼
Molly IV. of Banyule ..	4246	8.10.17	273	16½	8,716	5·10	444·61	250	506½
Parrakeet II.	Not yet allotted	11.10.17	273	9	4,493	5·10	229·02	175	261
Majesty's Starbright ..	1185	11.10.17	273	15½	6,493	5·33	346·38	250	394½
Silvermine XIII. ..	4250	12.10.17	273	13½	6,417	5·03	323·13	200	368¼
Colleen Bawn	2824	19.10.17	273	16½	6,316	5·82	367·50	250	419
Maitland's Petal ..	3538	8.11.17	273	19½	6,775	5·88	398·58	250	454½
Thora II.	Not yet allotted	15.11.17	273	11½	6,361	5·75	365·59	200	416¾
Thora III.	,,	2.12.17	273	16	6,682	6·00	400·97	200	457
Maguet's Lass III. ..	4263	12.12.17	273	20½	7,177	5·59	401·45	200	457½
Olive	2971	22.12.17	273	23	8,573	5·09	436·55	250	497½

C. D. LLOYD, Caulfield. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Mercedes Noble Queen (imp.)	4241	23.10.17	273	23¼	8,952	6·09	545·88	250	622¼

MEIER BROS., Box Hill. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Pansy's Promise ..	Not yet allotted	7.10.17	273	18	5,078	4·45	236·11	175	269¼

MUHLEBACH BROS., Batesford. (Ayrshire.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Sweet Marie of Retreat ..	4340	29.9.17	273	9	4,477	4·38	195·99	175	223¾
Daphne of Retreat ..	2959	8.10.17	273	5½	6,343	4·09	259·70	200	296

MRS. LILIAN ORCHARD, Grahamvale. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Alice	Not yet allotted	1.10.17	273	11	4,674	5·39	251·92	250	287¼

W. PARBURY, Warburton. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Dunalister's Clem	348 C.S.J.H.B.	15.10.17	273	7¼	4,232	6·04	255·84	175	291¾

MISS S. L. ROBINSON, Malvern. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Kyora's Pilbara ..	Not yet allotted	14.11.17	273	15	5,997	5·33	319·76	175	364½
Puen Buen Velvet VII. ..	3973	18.11.17	273	20½	7,786	4·93	383·58	200	437½

G. ROWE, Kardella. (Jersey.)

Completed since last report, 3. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Princess Dot	497 C.S.J.H.B.	16.11.17	273	6	3,646	6·05	220·72	200	251½

RYAN AND HOWLEY, Axedale. (Ayrshire.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Bonnie Lottie of Meadowbank	Not yet allotted	30.10.17	268	4	6,233	4·18	260·80	200	297½

A. H. S. SCHIER, Caldermeade. (Ayrshire.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Jeanette of Glengowrie ..	3857	27.9.17	273	10	4,985	4·12	205·87	200	234½
Rosebud II. of Pine Grove	4641	9.11.17	273	18	5,804	4·74	275·44	175	314

O. J. SYME, Macedon. (Friesian.)

Completed since last report, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Bolobek Lass	Not yet allotted	4.10.17	273	21	9,055	3·53	319·42	175	364½
Bolobek Ethel	,,	9.10.17	273	10½	9,538	4·06	387·19	250	441½
Duplicate Posch Princess Ena	,,	20.11.17	273	17½	10,449	3·68	384·45	250	438½
Queen of Friesland Park	,,	7.12.17	273	18	8,851	3·81	337·34	250	384½

W. WOODMASON, Malvern. (Jersey.)

Completed since last report, 20. Certificated, 20.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lady Elector II. of Melrose	Not yet allotted	28.9.17	273	15	6,558	6·02	394·51	250	449½
Chevy IX. of Melrose ..	,,	1.10.17	273	13	5,081	5·74	291·81	175	332½
Carrie VI. of Melrose ..	,,	4.10.17	273	11½	5,246	6·33	332·27	175	378½
Mystery XV. of Melrose ..	,,	21.10.17	273	11½	4,442	5·66	251·27	200	286½
Gaiety Girl VIII. of Melrose	,,	2.11.17	273	14	6,829	5·51	376·28	250	429
Peerless IX. of Melrose ..	,,	4.11.17	273	7½	4,774	5·40	257·91	250	294
Peerless XII. of Melrose ..	,,	12.11.17	273	15	5,042	6·02	303·71	175	346½
Daisy VII. of Melrose ..	,,	13.11.17	273	18	6,375	5·57	355·40	200	405½
Lady Elector III. of Melrose	,,	19.11.17	273	13	5,470	6·15	336·51	200	383½
Chevy VIII. of Melrose ..	4511	24.11.17	273	18½	6,271	5·78	362·24	250	413
Rarity VIII. of Melrose ..	Not yet allotted	27.11.17	273	21	6,890	6·60	425·13	200	484½
Daisy VI. of Melrose ..	*4512*	*4.12.17*	*273*	*12½*	*7,084*	*5·19*	*367·48*	*250*	*419*
Pearl II. of Melrose ..	3670	6.12.17	273	20½	6,407	5·26	336·98	250	384
Mermaid IV. of Melrose ..	Not yet allotted	8.12.17	273	15½	6,084	6·16	374·71	175	427½
Flower XI. of Melrose ..	,,	12.12.17	273	14	5,351	6·40	342·34	175	390½
Rarity VII. of Melrose ..	,,	24.12.17	273	19	6,190	5·25	324·87	250	370½
Peerless VI. of Melrose ..	3671	16.12.17	273	19½	7,434	6·03	448·15	250	511
Jessie V. of Melrose ..	3652	16.12.17	273	10½	5,504	5·15	283·39	250	323
Chevy VI. of Melrose ..	3635	24.12.17	273	22½	7,530	4·79	361·08	250	411½
Jessie VI. of Melrose ..	4519	25.12.17	273	27½	8,479	6·39	541·60	250	617½

LONGERENONG AGRICULTURAL COLLEGE.

FIFTH ANNUAL FIELD DAY.

Valuable Field Experiments.

(Abridged from the *Wimmera Star.*)

Despite the unpleasant weather conditions which prevailed, there was a very large gathering of farmers and others interested in agriculture at the Longerenong Agricultural College on Saturday afternoon, when the fifth annual field day was held under the auspices of the Horsham Agricultural Society. The long lines of motor cars drawn up in the avenue were eloquent testimony to the prosperity of the farmers, of the fertility of the district plains, and of the progress made in wheat growing during recent years. Amongst the visitors were the president and several members of the Rupanyup Agricultural and Pastoral Society, and farmers from Murtoa, Jung, Vectis, Walmer, Pimpinio, Minyip, and other parts of the district. The visitors were welcomed at the entrance to the experimental fields by Mr. A. C. Dreverman, the principal of the college.

An Instructive Exposition.

The Superintendent of Agriculture (Mr. A. E. V. Richardson, M.A., B.Sc.) then gave an introductory address, in the course of which he explained the objective of the experimental work, and described some of the results achieved during the past five years, after which he showed the visitors the experimental plots, the while he gave explanatory details.

Mr. Richardson said that the experimental plots were conducted by the Department of Agriculture, in co-operation with the Council of Agricultural Education, with the object of finding out the most profitable system of crop rotation for wheat in the Wimmera, the kind and quantity of the various fertilizers which would give most profit, the best varieties of wheat, barley, and forage crops to sow, the best rates of seeding, and times of sowing for wheat, and to improve wheat varieties by selection and cross-breeding, and to raise improved types of seed for distribution amongst farmers. The essential factors for the successful growth of wheat had been well worked out for Wimmera conditions. Still there were many farmers who did not strictly observe the fundamental principles in the raising of their crops. In order to make the matter perfectly clear, he proposed to review briefly these principles, and to show their application to local practice. The rainfall to date, 11 months, at the college was 14½ inches. It was what one would call a dry year. The rainfall was 3 inches short of the average, and the spring rains had failed. Notwithstanding this, there were crops in this district which would exceed 30 bushels to the acre. *and the 350 acres of wheat on the college farm would probably average more than 30 bushels to the acre. This result has been obtained* by the use of moisture-saving fallows. Bare fallowing was the first and fundamental requisite for the successful cultivation of wheat in a dry district. This was recognized by the Horsham farmers, for quite 90 per cent. of the wheat sown in the Borung county was sown on fallow land. In marked contrast to this was the county of Wecah, where this year

90 per cent. of the wheat was sown on stubble land—land which had borne a wheat crop last year. Despite the fact that the rainfall of Weeah averaged 3 to 5 inches less than the county of Borung, yet the amount fallowed in 1917 was but 10 per cent. of the total area sown in wheat in 1918. This failure to practise fallowing in the north-west Mallee, was, of course, partly due to the fact that the new Mallee was in the pioneering stages, and needed more or less continuous cropping to get rid of the mallee shoots. But in the older settled areas, where normal farming conditions prevailed, bare fallowing was a necessity for heavy yields, especially where the rainfall was less than 18 inches. The second essential was thorough working of the fallows. Horsham farmers should know the value of thorough working, for there were probably no wheat districts in the wheat belt of Australia where thorough working of the fallow was so carefully attended to as in this area of the Wimmera. Some men were lengthening the period of fallowing by discing up their lands in summer, ploughing them in June or July, working them through the summer months, and finally sowing in the following May or June. In other words, there were many who were working their fallows for fifteen months prior to seeding, in order to increase the amount of soil-conserved moisture to a maximum. The third factor in successful wheat-growing was liberal manuring, and on this point, the results of the experiments for the past five years were of particular interest. The results of the experiments here conclusively demonstrated that superphosphate was the most profitable of all manures to apply, and that the quantities used could be largely increased. Mr. Richardson then showed on a blackboard the yields for the past five years. These are summarized in the following table:—

—	Average Yield for Five Years.	Increase due to Manure.	Value of Increase at 4s. Bushel.
	bushels.		£ s. d.
1. No manure	23·8	nil	..
2. Superphosphate, 56 lbs.	30·4	6·6	1 6 5
3 Superphosphate, 1 cwt.	31·5	7·7	1 10 10
4. Superphosphate, 2 cwt.	33·1	9·3	1 17 2
5. Superphosphate, 1 cwt.; lime, 5 cwt. ..	29·6	5·8	1 3 2
6. Superphosphate, 1 cwt.; lime, 10 cwt. ..	29·8	6·0	1 4 10
7. Superphosphate, 1 cwt.; lime, 20 cwt. ..	28·0	4·2	0 16 10
8. Basic slag, 1 cwt.	26·2	2·4	0 9 7
9. Basic slag, ½ cwt.; superphosphate, ½ cwt. ..	29·5	5·7	1 3 10
10. Superphosphate, ½ cwt.; nitrate of soda, 1 cwt.	30·0	6·2	1 4 10
11. Farmyard manure	30·4	6·6	1 6 5

These results, Mr. Richardson pointed out, showed conclusively that—

(1) Superphosphate was the most profitable fertilizer.

(2) That it could be applied in quantities far greater than were customarily applied in the district.

(3) That the application of lime was actually harmful, and depressed the yields.

(4) That neither basic slag nor a mixture of basic slag and super. was as effective as super. alone.

Consider the first four plots. The application of ½ cwt. of superphosphate gave an increase over five years of 6.6 bushels. The value of this increase at 4s. per bushel for wheat was 26s. 5d. per acre. The fertilizer cost 2s. 6d. per acre. Hence the net profit over the unmanured plot was 23s. 11d. per acre.

Now the application of 1 cwt. of superphosphate, costing 5s., gave an increase of 7.7 bushels per acre, which was worth 30s. 10d., and the net profit 25s. 10d. per acre.

Finally, the 2 cwt. of superphosphate gave a 9.3 bushel increase, which was worth 37s. 2d., and, deducting the cost of the manure, 10s., left a net profit of 27s. 2d. per acre over the unmanured plot.

It was thus conclusively demonstrated that heavy dressings of superphosphate, even up to 2 cwt., paid. It was most important to note that these heavier dressings returned to the soil the full amount of phosphoric acid removed by the grain crop, and added a little to the fertility of the soil. The heavy dressings not only fed the wheat crop, and gave the heaviest return the rainfall would allow, but they also fed the grass which followed the wheat, and so increased the stock-carrying capacity of the land. Wheat farming, to be profitable, must be carried out in combination with sheep. The farmer must look to the carrying capacity of his farm as well as his wheat crop for full profits. Hence, the heavy manuring not only gave big returns with the wheat crop, but left sufficient phosphoric acid to stimulate greatly the stubble grazing, and thus increase the carrying capacity. The lime content of the Wimmera soil enabled liberal dressings of fertilizer to be used to advantage.

The fourth essential to successful cropping was systematic rotation of crops. They had established a new series of rotation plots this year, and proposed to make them permanent in character. Eight different systems of rotation were being practised. These might be called different systems of farming. Some of the rotations being tested were:—

(1) Wheat after wheat continuously.
(2) Wheat after bare fallow.
(3) Wheat, oats, bare fallow.
(4) Wheat, pasture, bare fallow.
(5) Wheat, oats, pease.
(6) Wheat, oats, pasture, bare fallow.
(7) Wheat, rape, barley, pease.
(8) Wheat, barley, pease.

These plots excited great interest, and promised to give information of a most valuable character to growers on the Horsham plains.

The fifth essential for success in wheat-growing, said Mr. Richardson, was good seed, properly graded, carefully pickled, and sown at the right time and in the right quantity. A number of tests showing the effects of early and late sowing and rate of sowing were examined with great interest by the visiting farmers.

Mr. Richardson then referred to the remarkable results obtained in the cultivation of barley at Longerenong. On two occasions in the past five years yields of 80 bushels had been obtained, and this year, despite

the dry season, the whole of the barley variety plots promised to yield over 50 bushels. The advantages of barley were:—

(1) It made excellent winter grazing for all kinds of stock. A barley paddock had been heavily grazed this winter with sheep and cattle, and promised to yield over 40 bushels of grain.

(2) It gave heavy yields of silage. Again the two silos had been filled from a paddock of barley, which yielded at the rate of 10 tons per acre.

(3) The grain made excellent food for stock, especially for pigs.

(4) It usually gave 50 to 100 per cent. heavier yield than wheat.

Besides this, barley was an early ripener, and in dry seasons it had proved more drought-resistant than either wheat or oats.

Mr. Richardson then gave a most interesting demonstration of the manner in which new barley varieties were produced, and showed how the different types obtained by cross-breeding inherited the parental characters in strict accordance with Mendel's law. A number of new types growing in the field was then inspected. Finally, he said, a number of new crossbred varieties of wheat were being tested in competition with older varieties, and the tests had shown the superiority of certain of the new crosses. These crosses were being further tested, and if the trials proved as satisfactory as those already conducted a number of improved new varieties would soon figure on the market.

The farmers then inspected the stud cereal, crossbred, and forage trials, the new crossbred wheats, the fertilizer, variety, rate of sowing, and time of sowing trials, and finally the permanent rotation tests. It was evident that the greatest interest was aroused by the demonstrations, for at every point Mr. Richardson was besieged with questions relating to every phase of cultivation.

The Social Side.

At the conclusion of the demonstration and lecture the visitors were entertained at afternoon tea by the Principal and Staff in the huge dining hall of the college. Mr. P. Learmonth, the President of the Horsham Agricultural Society, occupied the chair.

At the call of the chairman, who said that this was the first public gathering held in the college building since the cessation of hostilities, the National Anthem was sung.

Cr. A. E. Dahlenburg, who represented the Wimmera Shire Council, moved a cordial vote of thanks to Mr. Richardson, who, all present would agree, had given a lecture notable for its value and lucidity. Those who had attended these gatherings year after year must admit that the college was one of the best public institutions in Victoria. (Hear, hear.) The experiments conducted at the college had been of very great value to the farmers. The college might not pay for itself. That, however, was not a test of its value or efficiency. Twenty years ago the Wimmera farmer was satisfied if he obtained a return of 10 bushels to the acre; to-day he was not satisfied unless he got ten bags. (Applause.) In this connexion the work done at the college had been of very great value. Mr. Dreverman had a splendid staff, and great praise was due in particular to Mr. Tulloh, the wheat expert. (Hear, hear.) Mr. Richardson had recently visited America, and returned with a vast amount of valuable and interesting information.

There was not a better man for the agricultural industry than Mr. Richardson, whose heart and soul were in his work. (Applause.)

Mr. Richardson thanked the mover of the vote of thanks for his remarks, and those present for the cordial manner in which they had supported it. It afforded him very great pleasure, as the representative of the Department of Agriculture, to be present and hear the cordial expressions of opinion of favour as far as the experimental plots were concerned. Cr. Dahlenburg had mentioned a subject of very great importance to this community and to the country generally when he indicated the value of the work and training at the college. In the course of his remarks he incidentally mentioned that he (Mr. Richardson) had recently returned from a visit to the United States. There was almost an unbridgeable gulf between Australia and the United States with respect to the way in which the agricultural industry was supported and nurtured. The farmers were told every election time that they were the backbone and spinal cord of the country, yet during the last ten or fifteen years no serious efforts had been made to develop the agricultural colleges to the measure that they should be developed. In America everyone thought in terms of agriculture, and that thought found expression in the very liberal support of all institutions for the training of young men in agriculture. The State of Kansas was similar in its economic and social conditions to Victoria. Its area was 56,000,000 acres, and its rainfall was the same as, or a trifle less than, that of Victoria. The population was almost identical with that of Victoria, namely, a little over 1,500,000, and, like Victoria, it had one congested city. The elevation was about the same, from sea level to about 5,000 feet above. He did not believe that the soils of Kansas were any better than those of Victoria. Certainly there were no rich plains like those of the Wimmera and Western districts. There were, however, differences in all other respects. Kansas produced annually 180,000,000 bushels of wheat; Victoria produced 30,000,000 bushels. Kansas produced 170,000,000 bushels of maize as against 1,000,000 bushels grown in Victoria. Kansas had 1,500,000 acres of lucerne, and she had 4,000,000 cattle, there being only 1,000,000 in Victoria. She had 3,000,000 pigs, as against Victoria's 250,000. There were some 3,000 students in her agricultural college as against less than 100 in Victoria. Kansas spent £200,000 a year on her agricultural college, whereas in Victoria the expenditure was less than £20,000. Last year the farmers of Victoria brought in £100,000 of wealth per day. Victoria had a big loan bill to face, and had to find interest and set aside funds in liquidation of the debt. How could the necessary moneys be found? Certainly not by manufactures. There was only one way to find the money, and that was by production from the soil, and if they could not increase the production of wheat, stock, and other products, they would have a hard row to hoe. Increased production represented the key to the discharge of our liabilities, and one way to insure this was to develop agricultural education to the utmost limit. He asked the farmers to see that their Parliamentary representatives took steps to support the agricultural colleges, and to see that they adopted the proper attitude towards the development of the resources of the country. (Applause.) He was

confident that the quantity of wheat now produced could be trebled or quadrupled, and dairy produce could be doubled. Some years ago the State of Wisconsin was thirteenth on the list of dairy producing States, and now she was first. The unmistakable lesson was that we must develop our agricultural resources, and the way to do that was to increase the personal efficiency of the farmer of to-day, and to look to the young generation who would be the farmers of the future. If they were given a sound agricultural education all would go well with the State. Enormous quantites of products which were not grown at the present time in Victoria could be grown, and the United States had demonstrated the manner in which this could be done. Cr. Dahlenburg had mentioned that twenty years ago the farmer was satisfied with a return of 10 bushels to the acre, while now he was not satisfied with less than ten bags. They wanted not only ten bags, but twelve or fifteen, yields which, he was confident, it was possible to obtain on these fertile plains. All great countries had developed their systems of agriculture in times of stress, and as instances he quoted the United States of America, Denmark, and France. In conclusion, Mr. Richardson asked all present cordially to support any movement for increased facilities for agricultural education. (Applause.)

Mr. F. J. Sanders moved a vote of thanks to Mr. Dreverman and his staff for their hospitality. All present had spent a most delightful and profitable afternoon. (Applause.)

Mr. Dreverman, on behalf of the staff, thanked the mover of the motion for his appreciatory remarks, and those present for the manner in which they had been received. As the principal of the college, he was very much interested to hear the remarks of Mr. Richardson as to what was done in America. As far as the Longerenong Agricultural College was concerned, the net cost, after paying salaries and wages, did not amount to £500 per annum. (Hear, hear.) Last year the return from the farm was well over £5,000, the profit being about £2,300 from 2,300 acres of land. The work of the students was divided into educational and farm work, the latter being under the control of Mr. Munro, who, during six years, had done wonderfully good work. (Applause.) About a fortnight ago the institution was described by a section of the press as one of the ill-fated Government institutions. (Laughter.) It was gratifying and encouraging to know that the college authorities had the sympathy and support of the people of the district. He cordially invited those present to inspect the farm buildings and stock, and extended an invitation to farmers and others interested to visit the college at any time. They could be sure of a warm welcome. He was only too glad to give to inquirers any information at his command. (Applause.)

The president of the Rupanyup Agricultural and Pastoral Society remarked that this was his first visit to the college, and those who made the trip with him were highly pleased with Mr. Richardson's exposition and with what they had seen. They were certainly rewarded, as the day had been well spent. He felt sure that next year there would be many more farmers present from the Rupanyip district. (Applause.)

At the instance of Mr. Richardson the health of the chairman was cordially honoured.

The Farm.

Great interest was manifested in the farm buildings and equipment. A number of Ayrshire cattle purchased from prominent Ayrshire breeders created much favorable comment. The stables, cowshed, woolshed, dairy, and the cattle, sheep, and pigs were inspected under the direction of Mr. Dreverman, principal, and Mr. Munro, farm manager. The farm crops were looking particularly well, despite the dry season, and gave promise of averaging over 30 bushels per acre.

THE INFLUENCE OF EGG-LAYING COMPETITIONS.

By A. V. D. Rintoul, Assistant Poultry Expert.

The remarkable development which has taken place during the last few years in the fecundity of a number of breeds of fowls is undoubtedly due in a great measure to the popularity of the various egg-laying contests held throughout the world, and whereas a reputed score of 210 to 220 for one year was, ten or twelve years ago, inclined to be looked upon as something quite remarkable, it is now practically the minimum which would entitle a hen to a place in an ordinary breeding pen.

For one thing, the competitions have developed to a fairly high standard the selection of the most likely and best layers—a subject which will later form the basis of a chapter by itself—and this method of selection has been year after year applied, not only to the choosing of the pullets, but, aided by these results, has effected a vast improvement in the matings of the stud flock. Mathematics alone, however, are worthless in the stud pen, as the breeding hens must possess constitutional vigour, stamina, and some degree of type, even at the expense of a few eggs in their tally as pullets.

Another noteworthy feature of the competitions, in Australia at any rate, has been the great popularity of the White Leghorn for a number of years. Its popularity, however, is mainly due to the perseverance and skill of a small, but select, band of enthusiastic pioneers, who paved the way for this variety, as, despite the great merits of the White Leghorn as a layer, it will be admitted without question by most fair-minded breeders that had the same perseverance and ability been devoted to any other of the good laying varieties equally successful results might have been achieved. This point was fully recognised by the Department of Agriculture, and, in consequence, thirty extra pens were erected five years ago for the encouragement of the heavy breeds, there being at the time a margin of 50 eggs per bird in favour of the winning White Leghorns over the best Black Orpingtons.

The erection of these heavy breed pens marked a new era in poultry keeping in Victoria, and the result was a score of 1,562 by Mr. J. McAllan's Black Orpingtons, followed by those of Mr. L. W. Parker winning the weight of eggs prize with an average of 27.6 ozs. per dozen, and the Oaklands Poultry Farm Black Orpingtons established a world's

record winter test over all breeds of 570 eggs for four months for six birds.

Whilst, however, the laying abilities of the Black Orpington were so rapidly progressing, a distinct advance was taking place in White Leghorns, Mr. J. H. Gill's team scoring 1,667 for the year, and the following year Mr. W. N. O'Mullane's team set up a new world's record of 1,699 for the year, an average of just over 283 eggs per bird. This score marked another stage in the progress of the laying competitions, as with an average of 283 eggs per bird for a team it was fairly certain that at least one bird must have laid 300 or more eggs, but evidence was lacking as to which was the champion bird of the team.

Up to this period birds were generally bred from as a team, and the weak point of this system is fairly obvious. A team may have scored, say 1,350, for the six birds—an average of 225 eggs per bird—but the actual scores, if known, might individually have been 270, 268, 263, 234, 175, 140, and it may have happened that one of the cockerels saved from this team for subsequent breeding purposes might have been from the hen producing only 140 eggs, with consequent grave damage to the laying abilities of the progeny.

Young bull calves are sold from the Werribee herd, the price being determined by the butter fat yield of the dam, *i.e.*, an 800-lb. butter fat cow's bull calf is worth, say, 800s. (£40), whilst the 500-lb. butter fat cow's calf is only worth £25. Fecundity, whether in the form of butter production by the cow or egg production by the hen is transmitted from the dam through her son to his offspring, hence the son of the low producing hen is a menace to the poultry industry. Competitions in egg laying for teams of birds, as teams, have, therefore, now served their purpose in educating the public up to the high laying abilities of the various breeds of poultry, and are giving way to more direct methods of determining the individual laying qualities of each hen. Trap nesting is to be introduced this year at Burnley. When Mr. O'Mullane's team scored 1,699; it was purchased by Mr. E. A. Lawson for £75, which, although a fair sum of money, was an undoubted bargain for the plucky purchaser, who subsequently followed this up by purchasing, for £25 each, two single test hens, which had produced in an unofficial competition 315 and 313 eggs respectively. There is no doubt that the unofficial competitions have in the past year or two become very popular throughout the State, and afford an instructive comparison in regard to the results obtained under considerable variations in climatic conditions. At the same time it is only right to utter a word of warning in this respect, as whilst a win at even a small competition may have some influence on stud sales for the fortunate competitor, there is a growing tendency to pay too much heed to the actual results, and insufficient attention to the ultimate objective of the competitions, which is to improve the laying qualities of the flock rather than to produce an odd one or two, more or less, abnormal birds, in the hope of securing stud sales for surplus cockerels at high prices. This is a very insecure foundation for success compared with building up a good average laying flock. It is a well-known maxim that one swallow does not make a summer, and one hen laying 300 or more eggs does not by itself make a remunerative flock.

As a result of the first single test competition at Burnley the world's record was produced, Mr. C. E. Graham's Black Orpington, Record Queen, actually scoring 335 eggs for the year. An offer of £50 for this fine bird was refused. Whether this score will ever officially be exceeded is a question for the future, but there is no reason why other breeds, whether light or heavy, should not produce their own 300-egg representative.

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"A PENNY OVER TOP."

To secure a penny over highest market price for eggs generally seems to be the height of the average poultry farmer's ambition, and he rarely takes much practical interest in the factors which are responsible for bringing about the market price. As a matter of fact, the bulk of the highest class of new laid eggs do not reach the so-called market at all, as they are not consigned to the middlemen, but are sent direct by the producer to the grocers, hotels, clubs, cafés, and the like. Consequently, most of the supplies consigned to the "market" are sent in by country storekeepers who labour under certain disadvantages. Firstly, they have virtually to accept all eggs offered to them at the risk of losing other and more profitable business, which means that stale eggs, indifferently collected eggs, fertile eggs in hot weather, &c., are all included, which usually have to be paid for in cash, no matter how much may be owing for groceries; and, secondly, the price the storekeeper pays is based entirely on the probable "market" returns. Such practices result in an indifferent price being paid for a more or less indifferent article, a penny or so more being paid for "new laids," and this forms the basis on which the price is fixed—genuine auctioneering being conspicuously absent—for the enormous number of new laid eggs of the best quality. During the past twelve months 1s. 6d. per dozen was being paid in Wangaratta for new laid eggs on a Thursday; the metropolitan papers announced on the Friday that the Melbourne "market" price was 1s. 10d. a dozen, and on the Saturday Brighton grocers charged 2s. 6d. a dozen retail. Comment is superfluous. Another important influence is brought to bear on the market price by the sale of chilled eggs, which are foisted on the public by unscrupulous dealers as new laid, unjustly depressing the price at the time when there is a real scarcity of the genuine article. The bulk of the year's profits on the egg farm have to be made during March, April, May, and June; the high cost of feed, interest on capital, depreciation on buildings and equipment, together with eggs required for hatching, &c., leaving little over a bare margin of profit for the rest of the year. Eggs are cheap during the hatching and rearing season, a time when expenses are greatest; consequently, very few can afford to wait for the money from the sale of eggs which would be involved by chilling and holding over till the autumn. The result is that this business is almost entirely in the hands of the speculators and others, who are pecuniarily interested in depressed prices during the spring, and are able to compete unfairly against the genuine article. Co-operation is, of course, the best remedy, and reams of paper have been used to explain how admirably this is done in other countries. Quite so. But it must not be

forgotten that these countries have everything in their favour, small areas, and intensive population, as opposed to Australia—a country of vast areas, sadly under populated—in addition to which the cost of haulage is much lighter in European countries.

Co-operation, too, is difficult to adequately effect in the case of an article so generally produced, and so liable to deteriorate, as the new laid egg. Fruit-growing, for instance, is more a district matter, and the produce does not deteriorate so rapidly. Co-operation among fruit-growers is, therefore, more readily brought about. But co-operation among poultry farmers must come, and fairly quickly. Adelaide eggs are selling at 8½d., Melbourne eggs 11d., Sydney eggs 1s. 3d., all at the moment of writing. The time is fast approaching when the production of eggs in the Commonwealth will considerably exceed the demand; therefore, to avoid the prospective ruin of a prominent rural industry, exports must be arranged for. The opportunity is a great one, because eggs produced in Australia at the cheapest time of the year, and in best condition, can reach Europe or America when the highest prices are ruling. Eggs cannot be carried in a fruit chamber. They require a chamber to themselves, and to secure this a huge co-operative movement is necessary, so that the space may be secured and fully occupied. This and a thorough investigation of the present system of marketing eggs in Melbourne are imperative to establish the industry on a sound footing.

The opportunity which now presents itself to the National Utility Poultry Breeders' Association should be an historical one; producers should for the moment overlook the question whether they can get a ½d. per dozen more than their neighbours, and, uniting for the common weal in pooling their supplies, establish a regular export market at the right time of the year, and radically alter the present "market."

PEA HAY.

The Superintendent of Experiments of the Department of Agriculture in South Australia (Mr. W. J. Spafford), in reply to the question, "If a promising crop of peas fails to pod either through frost or dry weather, and it is cut whilst green, will it be of any value as hay?" said that peas, if properly handled, make very fair hay. Most of our cultivated plants are at their maximum of growth a short time after flowering, and from a hay point of view, are still very digestible at this stage, and so it is found that when cut soon after flowering and made into hay, the maximum amount of digestible foodstuff is secured. Peas are no different from our other hay crops in this respect, and for the purpose should be cut shortly after the bulk of the plants has flowered, say, a fortnight at the outside. In this hay the leaves are of the greatest value, and in curing care must be taken to see that the leaves are not allowed to become too dry and brittle. For the best results it should be cured in a manner similar to that adopted with lucerne, being put into comparatively small cocks, and only turned in the cool parts of the day (morning or evening), and stacked it before it becomes too dry.—*Adelaide Chronicle*, 4/1/1919.

LIST OF FERTILIZERS REGISTERED UNDER THE ARTIFICIAL FERTILIZERS ACT FOR THE YEAR 1919.

P. Rankin Scott, Chemist for Agriculture.

In the Artificial Fertilizers Act, a fertilizer is defined as "any substance containing nitrogen, phosphoric acid, or potash, manufactured, produced, or prepared in any manner for the purpose of fertilizing the soil or supplying nutriment to plants."

Before a manufacturer or importer of any material containing any or all of the above-mentioned can offer the same for sale in this State he is bound to register a brand for each fertilizer. Manufacturers and importers are obliged to submit for registration a brand for each fertilizer they intend offering for sale on or before the 1st day of November in each year. At the same time each applicant is required to give a statement of the percentage composition of the fertilizer in respect of its nitrogen, phosphoric acid, or potash, showing the forms in which they occur, and the retail price of the fertilizer. The term "form" has reference to the combination of the fertilizing constituent with other constituents, the availability of the fertilizer largely depending on the combination of the fertilizing element with other elements.

Nitrogen is obtainable this season in the form of ammonia, blood, and in bonedust, &c., as bone and flesh, while phosphoric acid is to be had as water soluble, citrate soluble, and citrate insoluble. Potash is still unobtainable for fertilizing purposes.

UNIT VALUE.

The procedure for calculating the unit values of the fertilizing ingredients according to their form of combination is laid down in section 27 of the Fertilizers Act. Unit values form the basis for estimating the value of any fertilizer during the year the values remain in force, and they provide a means of enabling a buyer to purchase at the most satisfactory prices. The calculation consists simply of multiplying the percentage of each ingredient by the price per unit, and adding together the products. Hereunder are shown in detail the methods of calculating the value per ton of a bonedust and of a bone fertilizer:—

Bonedust.

	Per cent.
Nitrogen	3.16
Phosphoric acid	20.20

Mechanical Condition.

Fine bone	42.00
Coarse bone	58.00

The first step is to determine the relative percentages of nitrogen and phosphoric acid, as fine and coarse bone, and, having done so, to

multiply these percentages by their unit value, and add together the products.

Nitrogen .. 3·16 % × $\frac{42}{100}$ = 1·327 % as fine bone
,, .. 3·16 % × $\frac{58}{100}$ = 1·833 % as coarse bone
Phosphoric acid 20·20 % × $\frac{42}{100}$ = 8·484 % as fine bone
,, ,, 20·20 % × $\frac{58}{100}$ = 11·716 % as coarse bone

	Per cent.		Unit Value.		Value per ton.		
∴	1·327	×	16/–	=	£1	1	3
	1·833	×	14/–	=	1	5	9
	8·484	×	5/–	=	2	2	5
	11·716	×	4/3	=	2	9	9
	Value per ton ..				£6	19	2

Bone Fertilizer.

	Guarantee.		Unit Value.		Value per ton.		
Nitrogen	3·00 %	×	15/–	..	£2	5	0
Phos. acid citrate soluble..	5·00 %	×	5/–	..	1	5	0
,, ,, ,, insoluble	11·00 %	×	3/6	..	1	18	6
					£5	8	6

From time to time attention has been directed to the difference between a bonedust and a bone fertilizer. As this is a subject of special importance to the user of fertilizers made from bones, and as bone fertilizers have been placed on the market as a substitute for bonedust, I shall again, briefly, make reference to it. Bonedust is a fertilizer made from either steamed or raw bones which have been crushed or ground. The value of a bonedust depends largely on its content of fertilizing ingredients, as well as on the relative percentages of fine and coarse bone, and the greater the percentage of fine bone, the quicker will be the disintegration of the bone in the average soil. Bone fertilizers are largely mixtures of bones with other materials, such as gypsum, marl, or superphosphate, and ground rock phosphate. They usually show a lower content of fertilizing ingredients than bonedust, while their high percentage of citrate insoluble phosphoric acid places them at a further disadvantage when compared with a bonedust, and it is gratifying to find that the demand for them is declining. Ground rock phosphate contains a large quantity of phosphoric acid, in combination with lime, in the least readily available form. Consequently an addition or admixture of rock phosphate or any similar ingredient tends to give any fertilizer a high percentage of citrate insoluble phosphoric acid. Therefore, before using bone fertilizers, farmers should carefully note from the label accompanying it the percentage of citrate soluble phosphoric acid it contains.

BASIC PHOSPHATE.

This fertilizer is of recent introduction, and owes its appearance on the list of published brands to the shortage of supply of Thomas Phosphate. It is prepared locally by mixing superphosphate with sufficient lime to neutralize all the free acid, and convert the superphosphate into a less soluble form. Superphosphate so treated contains its phosphoric acid mainly as citrate soluble, and thus bears some resemblance to Thomas Phosphate, but differs therefrom, however, in the degree of fineness of its particles, being much coarser grained. The finer the particles composing a fertilizer, the more surface will be exposed to the action of the various agencies in the soil. Superphosphate, when applied to the soil, undergoes a process of reversion. The phosphoric acid of the superphosphate is mostly soluble in water. When superphosphate is applied to land, the soil water will dissolve the phosphate, and bathe, within certain limits, the particles of soil it may reach. Meeting with small particles of lime, iron, and alumina oxides, it enters into combination with them, and reverts to a less soluble condition, and is deposited as a thin coating. A more intimate mixture is obtained with the soil by superphosphate than would be got through the use of basic phosphate. Further, as this fertilizer is prepared by mixing lime with superphosphate, it is reasonable to suppose that no advantage is to be gained by substituting this fertilizer for superphosphate on soil containing a fair percentage of lime.

Fertilizers Act 1915.

TABLE OF UNIT VALUES FOR THE YEAR 1919.

	Value per Unit. £ s. d.
Nitrogen, as Ammonia	0 19 6
„ Blood	1 0 0
„ Fine bone, and Bone and Blood	0 16 0
„ Bone and Animal Fertilizers	0 15 0
„ Coarse bone	0 14 3
Phosphoric Acid, as Water Soluble	0 5 8
„ „ Citrate Soluble, and as fine bone	0 5 0
„ „ Citrate Insoluble in roasted and intensely ground Phosphate	0 4 3
„ „ Coarse bone	
„ „ Citrate Insoluble in Bone Fertilizers, Bone and Super, and Super and Bone	0 3 6
„ „ Citrate Insoluble in Supers, Nitro-supers, and Basic Phosphates	0 1 0
„ „ Citrate Insoluble in ground rock phosphates	0 2 9

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652).

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.	Potash.	Price asked for the Fertilizer per ton.	Where Obtainable.
		%	%	%	£ s. d.	
Sulphate of Ammonia	M.G. Co.	20·59	..	..	18 0 0	The Metropolitan Gas Co., Flinders-street, Melbourne
,, ,, ...	Federal A.S. ..	20·00	..	..	20 0 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ...	Sickle	20·00	..	..	20 0 0	Cuming, Smith, and Co. Propty. Ltd., 65 William-street, Melbourne
,, ,, ...	M.L.	20·00	..	..	20 0 0	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ...	Wischer and Co. Propty. Ltd.	20·00	..	..	20 0 0	Wischer and Co. Propty. Ltd., 15 William-street, Melbourne
Blood	Imperial	10·50	..	..	11 0 0	W. Anglias and Co. Propty. Ltd., 42 Bourke-street, Melbourne
,, ...	S.C.D.B.	10·00	1·00	..	Not retailed	Sims, Cooper, and Co. (Aust.) Propty. Ltd., The Olderfleet, Melbourne
Blood Manure	M.G.C.	7·76	1·22	0·38	7 0 0	Melbourne City Council, City Desiccating Works, Smithfield-road, Kensington
Blood	Bendigo, Rohs ..	9·50	..	..	11 0 0	P. Rohs Propty. Ltd., Bendigo Bone Mills, Bendigo East
Blood Manure	Champion	11·50	1·60	..	Not retailed	John Cooke and Co. Propty. Ltd., 534 Collins-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652)—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.				Price asked for the Fertilizer per ton.	Where Obtainable.
			Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.		
Phosphate, readily Soluble.		%	%	%	%	%	£ s. d.	
Superphosphate ..	Federal O.S. ..	..	17·00	0·50	0·50	18·00	5 0 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ...	Sickle Florida ..	..	17·00	0·50	0·50	18·00	5 0 0	Cuming, Smith, and Co. Propty. Ltd., 65 William-street, Melbourne
,, ...	M.L. No. 1 ..	..	17·00	0·50	0·50	18·00	5 0 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ...	Wischer and Co. No. 1	..	17·00	0·50	0·50	18·00	5 0 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
,, ...	Hasell's ..	..	17·00	0·50	0·50	18·00	5 0 0	Arthur H. Hasell, 17 Queen-street, Melbourne
,, ...	Bendigo, Rohs ..	..	16·50	0·50	0·50	17·50	5 10 0	P. Rohs Propty. Ltd., Bendigo Bone Mills, Bendigo East
,, ...	J. Cockbill ..	..	17·00	0·50	0·50	18·00	5 5 0	J. Cockbill, 407 Post Office Place, Melbourne.
Concentrated Super ..	M.L.	..	40·00	4·00	..	44·00	13 10 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
Containing Nitrogen and Phosphoric Acid, readily Soluble.								
Nitro Superphosphate ..	Federal T.D. ..	1·55	15·30	0·45	0·45	16·20	6 15 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ..	Sickle T.D. ..	1·55	15·30	0·45	0·45	16·20	6 15 0	Cuming, Smith, and Co. Propty. Ltd., 65 William-street, Melbourne
,, ,, ..	M.L. No. 2 .. (Top dressing for grass)	1·55	15·30	0·45	0·45	16·20	6 15 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ..	Wischer and Co. Propty. Ltd. (Top dressing Manure)	1·55	15·30	0·45	0·45	16·20	6 15 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
,, ,, ..	Federal N.S. ..	2·08	13·18	0·38	1·71	15·27	6 15 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ..	Sickle	2·00	13·00	0·39	1·61	15·00	6 15 0	Cuming, Smith, and Co. Propty. Ltd., 65 William-street, Melbourne
,, ,, ..	M.L.	2·00	13·00	0·38	1·37	14·75	6 15 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ..	Wischer and Co. Propty. Ltd.	2·06	13·92	0·41	0·41	14·74	6 15 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652)—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.				Price asked for the Fertilizer per ton.	Where Obtainable.
			Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.		
Phosphoric Acid, readily Soluble.		%	%	%	%	%	£ s d	
Super and Bone ..	J. Cockbill ..	0·75	17·00	1·38	3·37	17·50	5 15 0	J. Cockbill, 407 Post Office Place, Melbourne
,, ,, ..	Federal B.S. No. 3	0·75	12·75	1·13	3·62	17·50	5 15 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ..	Sickle C.	0·75	12·75	1·37	3·38	17·50	5 15 0	Cuming, Smith, and Co. Propty. Ltd., 65 William-street, Melbourne
,, ,, ..	M.L. No. 2 ..	0·75	12·75	1·38	3·37	17·50	5 15 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
	Wischer and Co. No. 2	0·75	12·75	1·13	3·62	17·50	5 15 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
Phosphoric Acid, moderately Soluble.								
Bonedust and Super ..	Bendigo, Rohs ..	1·50	8·50	5·25	4·25	18·00	7 0 0	P. Rohs Propty. Ltd., Bendigo Bone Mills, Bendigo
Bone and Super ..	Hasell's "A" ..	1·50	8·50	3·00	7·00	18·50	5 14 0	Arthur H. Hasell, 17 Queen-street, Melbourne
,, ,, ..	Elsworth ..	1·50	9·00	2·50	5·00	16·50	6 5 0	W. R. Elsworth, corner of York and Joseph streets, Ballarat East
,, ,, ..	Sickle (A.) ..	1·50	8·50	3·25	5·25	17·00	6 10 0	Cuming, Smith, and Co. Propty. Ltd., 65 William-street, Melbourne
,, ,, ..	M.L. No. 1 ..	1·50	8·50	3·25	5·25	17·00	6 10 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, Superphosphate	Gardiner's ..	1·39	8·00	3·20	5·80	17·00	6 12 0	George Gardiner and Co. Propty. Ltd., Marshall-town, Geelong
Bone Fertilizer and Super	Federal B.S. No. 1	1·50	8·50	1·75	6·75	17·00	6 10 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
Super and Bone ..	Wischer and Co. No. 1	1·50	8·50	3·25	5·25	17·00	6 10 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
Blood Bonedust and Super	Bendigo, Rohs ..	4·00	5·50	6·25	2·25	14·00	8 5 0	P. Rohs Propty. Ltd., Bendigo Bone Mills, Bendigo
Market Garden Manure ..	Federal M.G. ..	4·00	4·37	3·12	4·63	12·12	7 0 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ,, ..	Sickle	4·00	4·37	3·12	4·63	12·12	7 0 0	Cuming, Smith, and Co. Propty. Ltd., 65 William-street, Melbourne
,, ,, ,, ..	M.L.	4.00	4·37	3·12	4·63	12·12	7 0 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ,, ..	Wischer and Co. Propty. Ltd.	4·00	4·37	3·12	4·63	12·12	7 0 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652)—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.				Price asked for the Fertilizer per ton.	Where Obtainable.
			Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.		
Containing Nitrogen and Phosphoric Acid.								
Difficultly Soluble.		%	%	%	%	%	£ s. d.	
Bonedust and Blood ..	Bendigo (Rohs) ..	6·00	..	3·00	6·00	9·00	9 10 0	P. Rohs Pty. Ltd.; Bendigo Bone Mills, Bendigo East
Blood and Bone ..	Hasell's	7·50	..	4·50	8·00	12·50	11 10 0	Arthur H. Hasell, 17 Queen-street, Melbourne
Fertilizer	Lighthouse ..	4·00	..	3·00	10·00	13·00	8 0 0	Thomas Borthwick and Sons (A'asia) Ltd., 84 William-street, Melbourne
Bone and Blood ..	Gardiner's Special Magic Fertilizer	5·00	..	3·00	10·00	13·00	7 5 0	George Gardiner and Co. Pty. Ltd., Marshalltown, Geelong
Blood and Bone ..	B.S.C.B.	5·50	..	6·60	7·40	14·00	Not retailed	Sims, Cooper, and Co. (Aust.) Propty. Ltd. Olderfleet, Collins-street, Melbourne
Bone Manure	J. Cockbill ..	6·00	..	5·00	10·00	15·00	8 10 0	J. Cockbill, 407 Post Office Place, Melbourne
Bone Fertilizer	Elsworth ..	3·00	..	5·50	10·50	16·00	6 15 0	W. R. Elsworth, corner of York and Joseph streets, Ballarat East
Fertilizer	Elsworth ..	3·00	1·50	4·00	9·50	15·00	6 10 0	,, ,, ,, ,, ,,
Bone Fertilizer	Horse Shoe ..	3·50	..	4·70	10·70	15·40	6 15 0	Patrick Fitzgerald and Sons, Warragul-road, Bentleigh
Animal Fertilizer ..	Champion ..	5·70	..	6·50	2·70	9·20	Not retailed	John Cooke and Co. Propty. Ltd., 534 Collins-street, Melbourne
Animal Fertilizer ..	A.N.A. Surprise ..	3·00	..	4·00	12·00	16·00	8 10 0	George W. Pennell, Braybrook
Bone Fertilizer	No 1. Magic ..	2·00	..	2·00	15·00	17·00	6 9 0	George Gardiner and Co. Pty. Ltd., Marshalltown, Geelong
,, ,, ...	No. 2 Magic ..	1·50	..	1·50	14·50	16·00	6 1 6	,, ,, ,, ,, ,,
,, ,, ...	Samson's ..	2·00	..	2·00	15·00	17·00	6 9 0	,, ,, ,, ,, ,,
,, ,, ...	J. Cockbill ..	3·50	..	3·50	14·75	18·25	7 0 0	J. Cockbill, 407 Post Office Place, Melbourne
Containing Phosphoric Acid only.								
Moderately Soluble.								
Basic Phosphate ..	Federal B.P. ..	..	..	14·00	3·00	17·00	4 10 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ..	Sickle	..	..	14·00	3·00	17·00	4 10 0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
,, ,, ..	M.L.	..	..	14·00	3·00	17·00	4 10 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ..	Wischer and Co Propty. Ltd.	..	..	14·00	3·00	17·00	4 10 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652)—*continued*.

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.				Price asked for the Fertilizer per ton.	Where Obtainable.
			Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.		
Difficultly Soluble.		%	%	%	%	%	£ s. d.	
Ground Phosphate ..	Federal G.P. ..	..	..	..	36·65	36·65	5 0 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ..	Sickle 50 % ..	..	..	..	23·00	23·00	3 10 0	Cuming, Smith, and Co. Pty. Ltd., 65 William-street, Melbourne
,, ,, ..	Sickle 60 % ..	..	..	..	27·50	27·50	4 0 0	,, ,, ,, ,, ,,
,, ,, ..	Sickle 80 % ..	..	..	..	36·65	36·65	5 0 0	,, ,, ,, ,, ,,
,, ,, ..	Hasell's Marion ..	..	..	..	27·50	27·50	4 10 0	Arthur H. Hasell, 17 Queen-street, Melbourne
,, ,, ..	M.L. 50 % ..	..	..	..	23·00	23·00	3 10 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ..	M.L. 60 % ..	..	..	..	27·50	27·50	4 0 0	,, ,, ,, ,, ,,
,, ,, ..	M.L. 80 % ..	..	..	..	36·65	36·65	5 0 0	,, ,, ,, ,, ,,
,, ,, ..	Wischer and Co. Pty. Ltd., 80 %	..	..	..	36·65	36·85	5 0 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
,, ,, ..	Victoria No. 3 ..	..	..	..	14·00	14·00	2 2 0	Heathcote Chemical Company Proprietary Limited, Sutton-street, North Melbourne
,, ,, ..	Victoria No. 4 ..	..	..	..	11·00	11·00	1 14 0	,, ,, ,, ,, ,,
Roasted and Intensely Ground	Victoria	..	..	3·00	12·00	15·00	3 3 6	,, ,, ,, ,, ,,

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.	Mechanical Condition.		Price asked for the Fertilizer per ton.	Where Obtainable.
				Fine Bone.	Coarse Bone.		
		%	%	%	%	£ s. d.	
Bonedust	Bendigo ("Rohs")	4.00	18·00	55·00	45·00	8 0 0	P. Rohs Pty. Ltd., Bendigo Bone Mills, Bendigo East
,, ...	Vauxhall ..	3·86	23·25	33·70	66·30	8 0 0	William Moore, Vauxhall Gardens, Panmure
,, ...	White Horse ..	2.50	17·00	60·00	40·00	7 0 0	Frederick William Richards, Warrenheip
,, ...	Lion	3·83	21·50	31·00	69·00	7 0 0	Alfred Wray, Raymond-street, Sale
,, ...	Ox	3·15	22·00	33·00	77·00	6 0 0	Executors Thos. Brown, Gray-street, Hamilton

4th December, 1918.

P. RANKIN SCOTT,
Chemist for Agriculture.

REMINDERS FOR FEBRUARY.

Live Stock.

HORSES: *At grass.*—Supplement dry grass, if possible, with some greenstuff. Provide plenty of pure water and shade shelter. *In stable.*—Supplement hard feed with some greenstuff, carrots, or the like, and give a bran mash once a week at least. Avoid over-stimulating foods, such as maize and barley. Give hard feed in quantities only consistent with work to be performed. Stable should be well ventilated, and kept clean. When at work, give water at short intervals. Always water before feeding. Great benefit will result in supplying horses—more especially young ones running at grass—with a lick. The following one is recommended:—

Salt	20 parts
Lime	20 parts
Superphosphate	10 parts
Sulphate of iron	5 parts.

By having troughs constructed that will protect the lick from rain a considerable saving will be made.

Horses at grass require their feet attended to at frequent intervals, otherwise deformity of feet and lameness may result.

CATTLE.—Provide succulent feed and plenty of clean water easy of access; also shade and salt lick in trough. Have each cow's milk weighed and tested for butter fat regularly. Rear heifer calves from those that show profitable results. Give milk at blood heat to calves. Keep utensils clean or diarrhœa will result. Do not give too much at a meal for the same reason. Give half-a-cup of limewater per calf per day in the milk. Let them have a good grass run or lucerne, or half-a-pound of crushed oats in a trough. Dehorn all dairy calves except those required for stud or show purposes. Keep bulls away from cows.

PIGS.—Sows about to farrow should be supplied with short bedding in well-ventilated styes. All pigs should be provided with shade and water to wallow in. There will be plenty of cheap feed available now, and there is a good margin between cost of feed and price for fat pigs. Read *Bulletin* No. 16, May, 1915. Pigs should be highly profitable animals to feed now.

SHEEP.—In the case of very strong cross ewes, rams should not be removed until well on in this month, for this class, together with most pure ewes of British blood, are only now coming in season. To breed out this late lambing tendency, and to procure quality and quantity of wool as well as a good carcass, use carefully-bred, level-made merino rams. If the right type be not procurable at reasonable rates, use good Corriedales or Comebacks. Should there be among the rams any distinctly inferior to the others, keep them back for three weeks. Remember, narrow inferior rams are invariably the most active workers compared with sheep of more substance.

Over a good area of the State feed conditions appear adverse. Keep salt available in all grass paddocks. Arrange for a hospital paddock. Select one watered by a trough and mix in Glauber salts. Pick out from time to time those sheep showing signs of impaction, and place "in hospital," removing them again later as appearances and circumstances direct. The effects of inferior dry feed and stagnant water are responsible later on for severe losses of both ewes and lambs, as well as for fly trouble at lambing.

If necessary to feed do not wait until in-lamb ewes are weak before commencing. Avoid moving good woolled sheep unnecessarily in heat and dust of summer.

Drench any weaners and young sheep scouring.

POULTRY.—Chickens should now be trained to perch; they will be more healthy.

Provide plenty of green feed and give less grain and meat. Avoid condiments. Keep water in cool shady spot and renew three times each day. Keep dust bath damp.

Birds showing symptoms of leg weakness should be given 1 grain of quinine per day (three months old chickens, ½ grain) and plenty of milk.

Cultivation.

FARM.—See that haystacks are weatherproof. Cultivate stubble and fallow, and prepare land for winter fodder crops. Get tobacco sheds ready for crop. In districts where February rains are good, sow rye, barley, vetches, and oats for early winter feed.

ORCHARD.—Spray for codlin moth. Search out and destroy all larvæ. Cultivate the surface where necessary and irrigate where necessary, paying particular attention to young trees. Fumigate evergreen trees for scale. Continue budding.

FLOWER GARDEN.—Cultivate the surface and water thoroughly during hot weather. Summer-prune roses by thinning out the weak wood and cutting back lightly the strong shoots. Thin out and disbud dahlias and chrysanthemums. Layer carnations. Plant a few bulbs for early blooms. Sow seeds of perennial and hardy annual plants.

VEGETABLE GARDEN.—Continue to plant out seedlings from the seed-beds. Sow seeds of cabbage, lettuce, cauliflower, peas, turnip, and French beans. Keep all vacant plots well dug.

VINEYARD.—February is the best month for the "Yema" or Summer bud graft (see journal for February, 1917). Select scion-bearing vines; mark with oil paint those conspicuous for quality and quantity of fruit, regular setting and even maturity.

Given suitable climatic conditions, downy mildew may show up in January or February. If heavy rains fall the vines should again be sprayed with Bordeaux mixture.

Sulphur again, if oidium is prevalent, but avoid applying sulphur to wine grapes too short a time before gathering.

Cellars.—Prepare all plant and casks for the coming vintage. An ounce of bisulphite of potash, or a couple of fluid ounces of bisulphite of soda solution, to each bucket of water used to swell press platforms, tubs, &c., will help to keep it sweet. Keep cellars as cool as possible. Complete all manipulations so as to avoid handling older wines during vintage.

THE BUDDING OF FRUIT TREES.

Young trees, or old trees that have been previously cut down in preparation for budding, may be worked towards the end of this month. It is advisable to select dull, cool weather for the operation, so that the sap may run more freely, and that atmospheric conditions may not have too drying an effect on the bud. The operation of budding is a very simple one, and is easily performed. To gain a successful end, the sap should be flowing freely, so that when the cuts are made the bark should "lift" or "run" easily, and without any clinging or tearing of the fibres, and it should separate freely from the wood. The bud selected should be firm and well matured, and should show no signs of premature growth whatever. It should be cut from the scion with a shallow cut, and if any wood be left in the cutting it should be taken out of the bud. A smooth, clean spot should be selected on the bark of the stock, and a T-shaped cut made, the vertical cut being longer than the horizontal one. The bark at the point where the cuts meet should be raised, and the bud inserted between the bark and the wood of the stock. The bud should be gently pressed down into position, and then bound with soft twine, string, or raffia. If the bud be too long for the cut, the top may be cut off level by means of a horizontal cut. With practice, it will soon become possible to take the buds so that they will need neither cutting nor trimming.

After two or three weeks the buds should be examined to see if they have "taken," that is, if the bud has united thoroughly to the stock. When this occurs, the tie may be cut. If a growth be desired at once, all wood above the bud may be cut off some short distance above the bud, so as to prevent any bark splitting, and consequent loss of the bud, and so as to throw the bud out at a fair angle. Ultimately this should be properly trimmed.

If desired, the bud may be left dormant throughout the autumn and winter till spring. In this case, the branch should not be cut off, but left on till the usual winter pruning.